January 1958 Pages 1-76

The Journal *of the* Society of Dyers and Colourists

Volume 74 Number 1

CONTENTS

THE SOCIETY OF DYERS AND COLOURISTS
DEAN HOUSE PICCADILLY BRADFORD YORKSHIRE

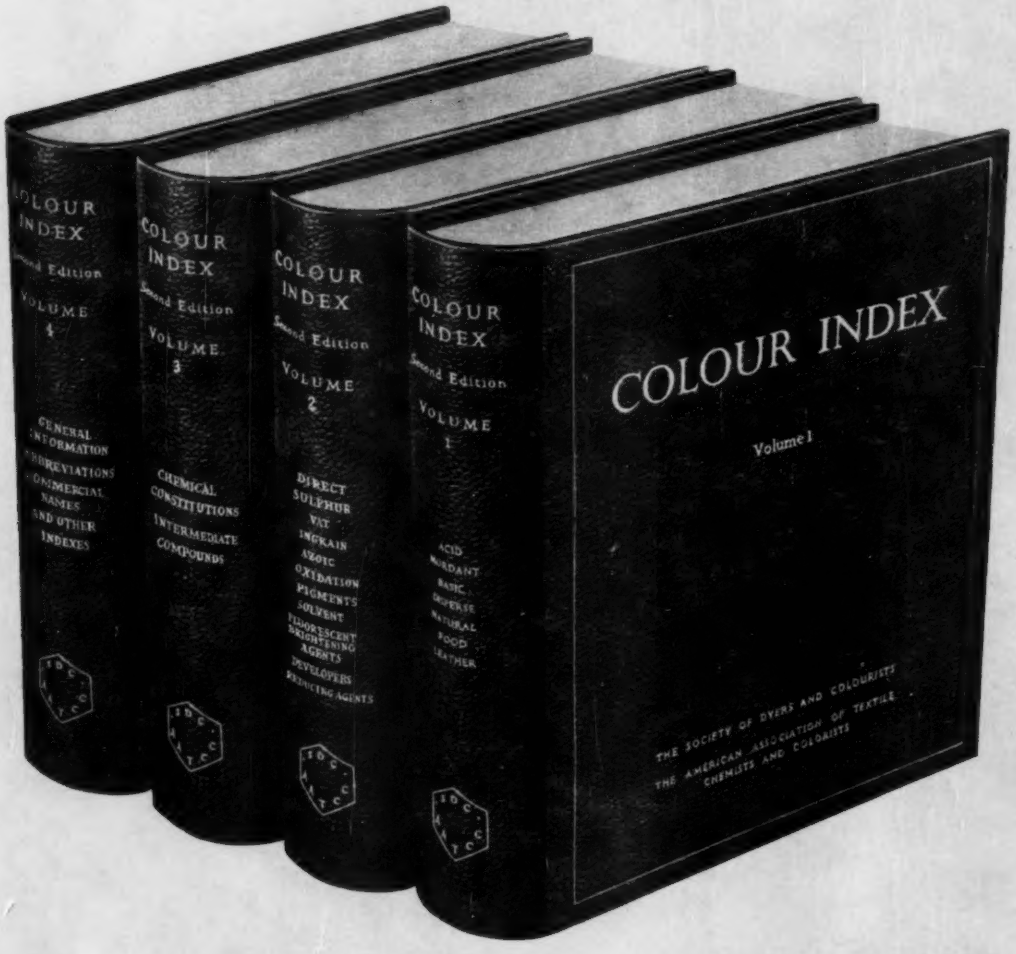
NEW COLOUR INDEX

Produced by

THE SOCIETY OF DYERS AND COLOURISTS

and

THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS



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ANNUAL GENERAL MEETING AND DINNER

also

JUBILEE OF THE SCOTTISH SECTION

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All other inquiries should be directed to The General Secretary
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Dean House 19 Piccadilly Bradford 1 Yorkshire
Telephone 25138 (3 lines)

INTERNATIONAL FEDERATION OF ASSOCIATIONS OF TEXTILE CHEMISTS AND COLOURISTS

1959 INTERNATIONAL CONGRESS IN LONDON

The first visit to England by the International Federation of Associations of Textile Chemists and Colourists will be made in 1959 when the *host member Society* will be The Society of Dyers and Colourists

The Congress will be held on
WEDNESDAY THURSDAY FRIDAY 16 17 18 SEPTEMBER 1959
with the Congress centre at

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During the Congress the social events will include a Dinner and Gala Ball in The Great Room, Grosvenor House, Park Lane, London
on
Friday evening 18 September 1959
The social events will also include tours and special attractions for the ladies

Already heavy advance reservations have been received for tickets and all interested are invited to communicate with —

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the twelve labours

In the ninth labour Hercules had also to make a long journey. This time he was sent to fetch the girdle of Hippolyte, the queen of the warlike Amazons, who dwelled in the land of Scythia.

Some say that he killed the queen after a hard fight, and others that he only captured her and gave her in marriage to his friend Theseus. At any rate, Hercules accomplished his mission and he brought back the girdle to Eurystheus.

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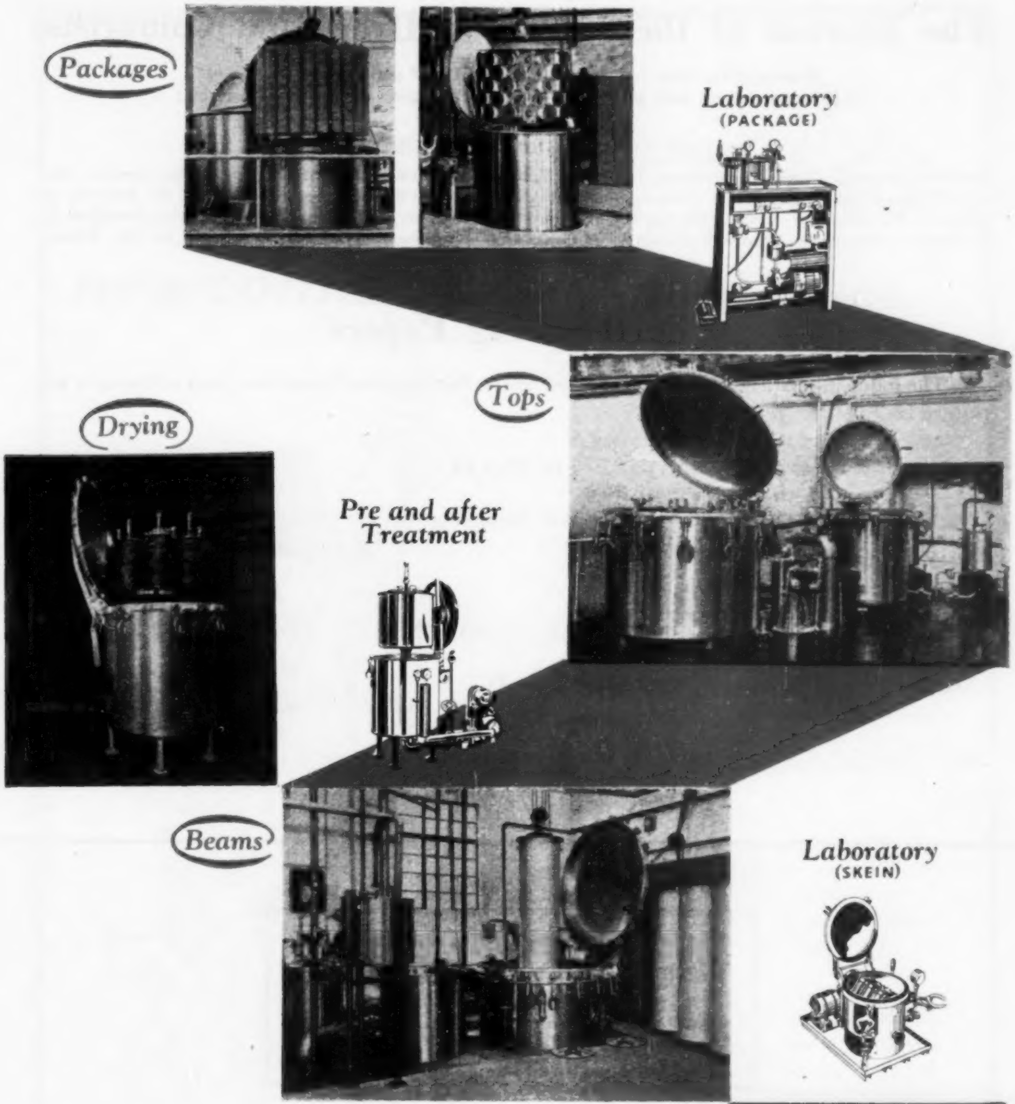

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NOTICE TO MEMBERS AND SUBSCRIBERS

Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–7 of the January 1958 and pages 285–290 of the July 1957 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (*Telephone* Bradford 25138). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

The Effect of Mechanical Action in the Wet Processing of Fibre Blends — *R. C. Cheetham and H. D. Edwards*

COMMUNICATIONS

Measurement of Damage in Wool Materials— IV — *J. W. Bell, D. P. Veldsman, and C. S. Whewell*

The "Pad-Jig" System of Applying Vat Dyes to Linen Piece Goods — *J. N. F. Phillips*

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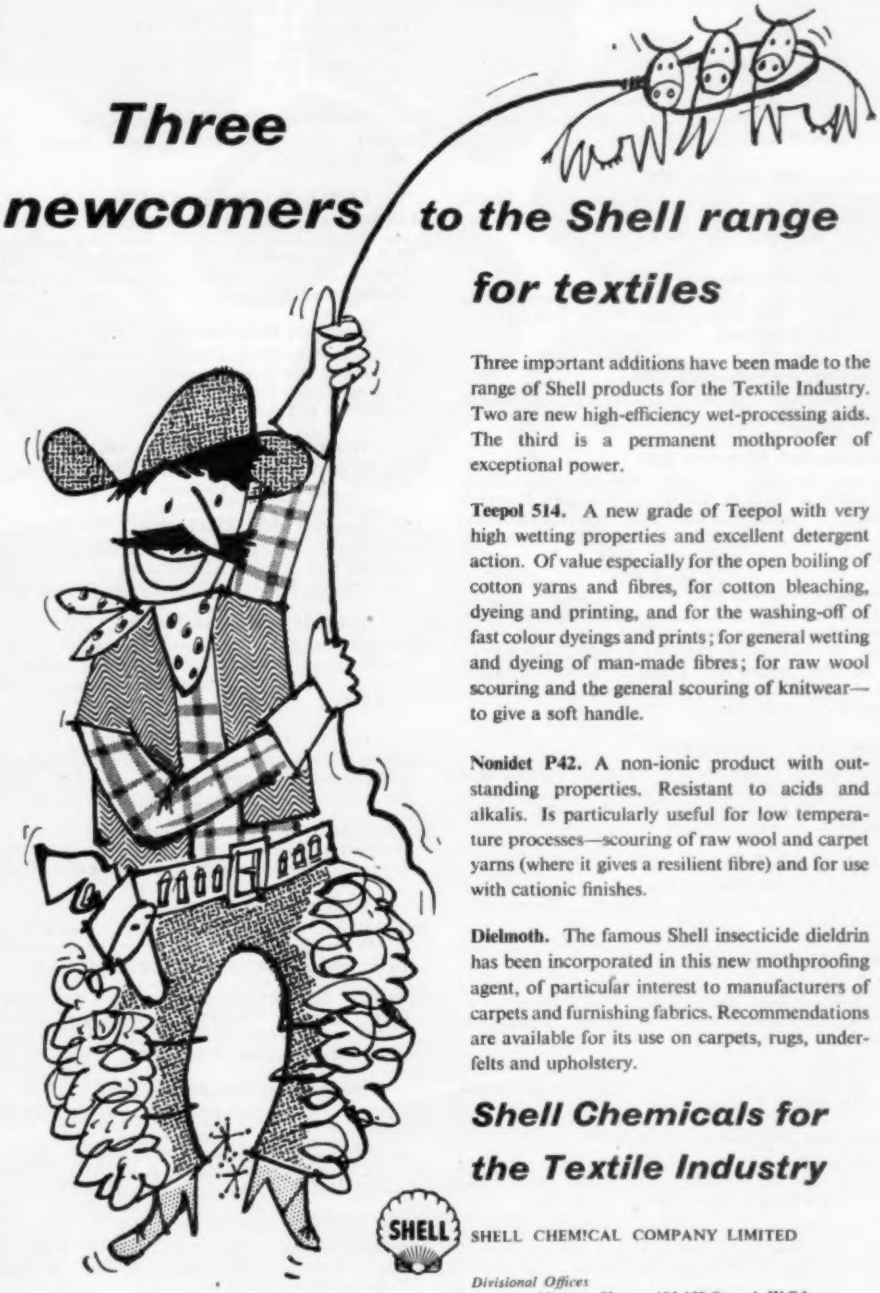

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FORTHCOMING MEETINGS OF THE SOCIETY

Friday, 24th January 1958

West Riding Section. Ladies' Evening. Victoria Hotel, **Bradford.** 7.30 p.m.

Monday, 27th January 1958

Bradford Junior Branch. *Spun-dyed Fibres, their Properties and Uses.* C. C. Wilcock, Esq., A.R.T.C., F.T.I., F.S.D.C. (Courtaulds Ltd.). Bradford Institute of Technology, **Bradford.** 7.15 p.m.

Tuesday, 28th January 1958

Leeds Junior Branch. *Organic Pigments.* F. M. Smith, Esq., Ph.D. Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.15 p.m.

Thursday, 30th January 1958

West Riding Section. *A New Approach to Pigment Dyeing of Piece Goods.* T. Weber, Esq. (Ciba Ltd., Basle). Victoria Hotel, **Bradford.** 7.30 p.m.

Saturday, 1st February 1958

Manchester Section. Annual Dinner and Dance. Grand Hotel, **Manchester.** 6 p.m. for 6.30 p.m.

Monday, 3rd February 1958

Huddersfield Section. *Shrink Resistance of Wool.* A. N. Davidson, Esq., B.Sc. (Wool Industries Research Association). (Joint Lecture with the Huddersfield Textile Society.) Technical College, **Huddersfield.** 7.30 p.m.

Tuesday, 4th February 1958

London Section. *Progress in Textile. A review of developments and their effect on industry and user—Dyeing and Finishing.* T. Vickerstaff, Esq., M.Sc., Ph.D., F.S.D.C. (Joint Meeting with the London Section, Textile Institute.) Chemical Society, Burlington House, **London, W.1.** 6.30 p.m.

Friday, 7th February 1958

London Section. *Spun-dyed Fibres, their Properties and Uses.* C. C. Wilcock, Esq., A.R.T.C.S., F.T.I., F.S.D.C. (Courtaulds Ltd.). Royal Society, Burlington House, **London, W.1.** 6 p.m.

Monday, 10th February 1958

Northern Ireland Section. *A New Approach to Pigment Dyeing.* T. Weber, Esq. (Ciba Limited). Thompson's Restaurant, **Belfast.** 7.30 p.m.

Tuesday, 11th February 1958

Bradford Junior Branch. *The Role of Optical Whitening Agents.* C. Fearnley, Esq., B.Sc., Ph.D. (Geigy Co. Ltd.). Bradford Institute of Technology, **Bradford.** 7.15 p.m.

Scottish Section. *A New Approach to Pigment Dyeing of Piece Goods.* T. Weber, Esq. (Ciba Limited). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Thursday, 13th February 1958

Manchester Junior Branch. *The Scientific Background to Mangling.* E. Moss, Esq. Room C9, Manchester College of Technology, **Manchester.** 4.30 p.m.

Midlands Section. *A New Approach to the Pigment Dyeing of Piece Goods.* T. Weber, Esq. (Ciba Ltd, Basle.) Gas Board Theatre, **Nottingham.** 7 p.m.

West Riding Section. *Investigations on the Dyeing Process of Polyester Fibres with Disperse Dyes.* Dr. Glenz (Bayer Co., Leverkusen). Metropole Hotel, King Street, **Leeds.** 7.30 p.m.

Tuesday, 18th February 1958

Huddersfield Section. *The Continuous Dyeing of Wool.* D. R. Lemin, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Tuesday, 18th February 1958

Scottish Junior Branch. *Shrinkage in Laundering.* F. R. Hill Esq., B.Sc., A.R.I.C., A.T.I. (The British Launderers' Research Association). (Joint Meeting at the invitation of The Textile Institute.) Technical College, **Paisley.** 7.30 p.m.

Thursday, 20th February 1958

Bradford Junior Branch. Annual Dance. Fountains Hall, **Bradford.**

Friday, 21st February 1958

Manchester Section. *The Application of Acrylonitrile in the Textile Industry.* J. H. MacGregor, Esq., Ph.D., F.R.I.C. (Courtaulds Ltd., Textile Research Laboratory, Bocking). The Textile Institute, 10 Blackfriars Street, **Manchester 3.** 7 p.m.

Tuesday, 25th February 1958

Leeds Junior Branch. Title to be announced later. Miss E. Smith., The Departmental Lecture Theatre, Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.15 p.m.

Thursday, 27th February 1958

West Riding Section. J. B. Speakman. Esq., D.Sc., F.R.I.C., F.T.I. Details later.

Tuesday, 4th March 1958

Leeds Junior Branch. *Optical Bleaching Agents.* D. A. W. Adams, Esq., Ph.D. Department of Colour Chemistry and Dyeing, The University, **Leeds 2.** 3.15 p.m.

Thursday, 6th March 1958

Scottish Section. *Continuous Dyeing of Wool.* D. R. Lemin, Esq., B.Sc. (Imperial Chemical Industries Ltd.). Scottish Woollen Technical College, **Galashiels.** 7.15 p.m.

Friday, 7th March 1958

Bradford Junior Branch. *The Dyeing of Cellulosic Fibres with Alcian X Dyestuffs.* J. T. Turner, Esq. (I.C.I. Ltd.). Bradford Institute of Technology, **Bradford.** 7.15 p.m.

London Section. *Recent Developments in the Dyeing of Man-made Fibres.* Dr. R. Wittwer (Ciba Ltd.). Royal Society, Burlington House, **London, W.1.** 6 p.m.

Tuesday, 11th March 1958

Huddersfield Section. *Recent Developments in the Dyeing of Man-made Fibres.* Lecturer to be announced later. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Northern Ireland Section. *Some Observations in the Uses of Synthetic Resin Products and Chemical Reactants to Cellulosic Materials.* F. Sloan, Esq., M.Sc. (Kirkpatrick Bros. Ltd.). Further details later.

Wednesday, 12th March 1958

Scottish Junior Branch. Annual General Meeting. 7 p.m.
Lecture 7.45 p.m. *The Drying of Textiles.* K. S. Laurie, Esq., M.A., A.M.I.Mech.E., A.M.I.E.E. (John Dalglish & Sons Ltd.). Technical College, **Paisley.**

Thursday, 13th March 1958

Manchester Junior Branch. *Terylene.* J. R. Whinfield, Esq. Room C9, Manchester College of Technology, **Manchester.** 4.30 p.m.

West Riding Section. Discussion, *Fluorescent Brightening Agents.*

Panel:
- A Member of the British Cotton Industries Research Association.
- J. S. Ingham, Esq. (Marks & Spencer Ltd.).
- Dr. Fearnley (Geigy Co. Ltd., Manchester).
- J. Rayment, Esq. (G. & W. N. Hicking).

Victoria Hotel, **Bradford.** 7.30 p.m.

continued on page xxxi


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THE JOURNAL
OF THE
Society of Dyers and Colourists

Volume 74 Number 1 JANUARY 1958 *Issued Monthly*

OFFICIAL NOTICES

OBJECTS OF THE SOCIETY OF DYERS AND COLOURISTS

To promote the advancement of science and technology, especially in the theory and practice of the tinctorial arts.

To provide means for the wider dissemination and interchange of knowledge concerning the science and technology of colour and colouring matters, of their methods of application, and of the materials to which they may be applied.

To encourage education and research in any or all of the above subjects.

And for the furtherance of these objects—

To hold meetings for the reading of papers, for lectures, and for discussions.

To publish a *Journal*.

And to do all such other things as may be conducive to the attainment of these objects.

ELECTION OF OFFICERS AND MEMBERS OF COUNCIL

Under the revised Bye-laws which are now operative, Officers and Members of Council— other than the President and President-elect, who are nominated by Council and elected at the Annual General Meeting— are to be elected by a Postal Ballot of the members.

The attention of members is drawn to Bye-laws No. 12–21 inclusive and 22–26 inclusive, which relate to Officers and Members of Council respectively.

Nominations to be valid must be received by the Honorary Secretary of the Society at least six weeks prior to the date of the Annual General Meeting, which is on 25th April 1958.

MEMBERS AND JUNIOR MEMBERS

Persons desirous of joining the Society as Ordinary Members or Junior Members may obtain Application Forms from the Secretary or from the Honorary Secretary of any Section of the Society. Applications must be proposed and seconded by members to whom the applicants are known personally. The rates of annual subscription are as follows—

(i) During the period of "full-time national service" the annual subscription to be waived entirely. Such members will be asked whether they wish to receive the *Journal*.

(ii) Ordinary Members between the ages of 21 and 25 years who are students, i.e. who are pursuing an accepted course, full or part time, at a recognised technical college or university and vouched for by the head of their department or other responsible person— 15s. 0d.

(iii) Other Ordinary Members between the ages of 21 and 25 years— £2 2s. 0d.

(iv) Members having had forty years' continuous membership of the Society to be given the option of paying half the current annual subscription (vi) for Ordinary Members.

(v) Members having had fifty years' continuous membership of the Society— the annual subscription to be waived entirely.

(vi) All other Ordinary Members— £3 3s. 0d.

(vii) All other Junior Members— 15s. 0d.

FELLOWS, ASSOCIATES, AND REGISTERED STUDENTS

The Society confers diplomas in tinctorial technology on suitably qualified members. These distinctions are in two grades— the Associateship and the Fellowship— and confer the right to use the title Associate of the Society of Dyers and Colourists (A.S.D.C.) or Fellow of the Society of Dyers and Colourists (F.S.D.C.). To obtain the Associateship candidates are required to pass the prescribed examinations and to furnish evidence of satisfactory general education and of training and experience in at least one branch of the manufacture or application of colouring matters. The Fellowship is conferred on senior members who have attained high standing in the knowledge and practice of tinctorial technology. Students who intend to take the Society's examination are strongly recommended to become Registered Students, so that their studies and preparation may be effectively directed.

Copies of the regulations and syllabuses may be obtained on application to the offices of the Society, Dean House, 19 Piccadilly, Bradford 1, Yorkshire.

The *JOURNAL*

The *Journal* is posted free to all Members. Non-members can obtain copies on application to the Offices of the Society. All orders must be accompanied by a remittance of 8s. 9d. per copy (£5 5s. 0d. per annum post free). Back numbers of most issues of the Society's *Journal* can be supplied.

Members are reminded that under Bye-law 42 the *Journal* will not be forwarded to those who have not paid their subscription by 30th June 1958.

Members residing abroad are particularly requested to inform the General Secretary by separate post when forwarding their subscriptions.

Communications on any subject related to the objects of the Society, especially such as are of an original character, are invited for consideration for publication in the *Journal*. Such Communications in the first instance should be addressed to the Editor at the offices of the Society.

The *JOURNAL*—*contd.*

General communications, including inquiries or orders for advertisements, should be addressed to the offices of the Society, to which address all remittances should be sent.

REPRINTS OF LECTURES AND COMMUNICATIONS

Reprints of all lectures and communications are available after publication to members of the Society and non-members. The charges (postage included) are as follows— Single copies 3s. 4d. each; per dozen copies up to and including 8 pages 16s. 0d., and for papers occupying more than 8 pages of the *Journal* 22s. 6d. Orders should be addressed to the Society's offices. They can be accepted only if accompanied by remittance and if received immediately after publication of the paper.

ABSTRACTS SECTION

Attention is drawn to the fact that copies of the Abstracts Section of the *Journal* printed on only one side of the paper, so that individual abstracts can be cut out and pasted on cards, are available at a charge of £2 0s. 0d. per annum. Orders should be sent to the Society's offices.

FREE ADVERTISEMENTS

For the convenience of members the Publications Committee allows a limited number of advertisements relating to SITUATIONS WANTED to be inserted in the *Journal gratis*. Such advertisements must not exceed 24 words in length.

Replies may be addressed, *Box—, Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire.*

NOTICE TO AUTHORS OF PAPERS

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor at the offices of the Society. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. Centre headings should be employed sparingly. Side headings should be indented and underlined, and run into the text to which they apply by means of a dash. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the Index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Annual Index should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and they should be indicated by small circles rather than by crosses in the case of a single graph, but where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

Twenty-five free copies of a reprint are supplied to the author of an original paper published in the *Journal*, or fifty free copies are supplied when there are two or more authors, and a further number may be purchased from the Society at the rates given above.

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Lecturers are required to sign an agreement regarding copyright and publication, copies of which are supplied by the Honorary Secretaries of Sections.

The Society subscribes to the Royal Society Fair Copying Declaration (J.S.D.C., **66**, 54 (Jan. 1950); **67**, 236 (June 1951)).

LOAN OF BOOKS AND PERIODICALS

Many of the books and periodicals reviewed or abstracted in the *Journal* since 1948 (and in some cases earlier) are retained by the Society, and may be borrowed by members. Enquiries and applications should be directed to the Editor at the offices of the Society.

LIBRARY OF THE CHEMICAL SOCIETY—LOAN OF BOOKS

Members of the Society may borrow books from the very extensive collection of works on pure and applied chemistry in the Library of the Chemical Society, by applying direct to *The Librarian, The Chemical Society, Burlington House, Piccadilly, London W.1* (*REGent 0675–6*), *and referring to their membership of the Society of Dyers and Colourists.* Letters on the subject should *not* be addressed to the offices of the Society in Bradford.

DEPOSIT OF SEALED COMMUNICATIONS

I— The Society is prepared to receive from members and others and to keep as deposits, Sealed Communications dealing with any subject relating to the theory or practice of the Dyeing, Printing, and kindred industries.

II— Every deposit must bear on the cover a title for classification, the author's name, the date, and must be secured by a distinctive seal.

III— The deposit should be written in English, and, if it deals with machinery, be accompanied by sketches or drawings, or, in the case of dyeing or printing processes, by patterns.

IV— Every deposit will, unopened, be signed and sealed by the Honorary Secretary of the Society, immediately after receipt, and countersigned by another member of the Council.

V— The deposits will be numbered and entered into a special register, and an official receipt will be sent to the author.

VI— No charge will be made for registration and deposit.

VII— The deposits will be kept by the Society for a period of seven years. At the end of this period they will be opened and the contents read before the next meeting of the Council of the Society, and the contents, or an abstract thereof, may be published in the *Journal* of the Society at the discretion of the Publications Committee.

VIII— The author shall have the right to recall his deposit unopened at any time within the said seven years, or he may, at any time, order it to be opened and read before one of the Society's meetings. Such instructions must be accompanied by the official receipt.

IX— The Society will take every reasonable care of the deposits, but cannot be held responsible for their loss.

MEDALS AND AWARDS

HONORARY MEMBERS OF THE SOCIETY

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1902–1926	*Dr. F. H. Bowman
1908–1916	*Prof. C. Graebe
1908–1915	*Prof. C. Liebermann
1911–1916	*Prof. Adolf von Baeyer
1914–1924	*Count Hilaire de Chardonnet
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1921–1930	*Horace A. Lowe
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1925–1927	*Maurice Prud'homme
1927–1930	*Ernest Hickson
1928–1939	*Dr. R. E. Schmidt
1931–1933	*Dr. Alfred Rée
1932–1940	*Prof. W. M. Gardner
1934–1947	*George Douglas
1934–1946	*H. Grandage
1934–1940	*Christopher Rawson
1941–1948	*Prof. E. C. C. Baly, C.B.E.
1944–1946	*Prof. F. M. Rowe
1946	*James S. Ridsdale
1947	Dr. C. J. T. Cronshaw
1948–1956	*H. Jennison, M.C.
1950–1953	*George E. Holden, C.B.E.
1953	John Barritt
1954	Fred Scholefield
	Dr. Croyden Meredith Whittaker
1955	Sir Robert Robinson, O.M., Nobel Laureate
1956	Fred Smith

The following have been *ex officio* Honorary Members of the Society, the later dates indicating termination or change in title of the office—

1886–1920	The Worshipful Master of the Dyers' Company
1920–	The Prime Warden of the Worshipful Company of Dyers
1886–1900	The President, Bradford Technical College
1900–1905	*W. E. B. Priestley, Chairman of the Technical Instruction Committee of the Bradford City Council

*Deceased

THE PERKIN MEDAL

The Perkin Medal was modelled by the late F. W. Pomeroy, R.A., for the Society. It is an excellent presentation of the head of Sir William Perkin, the founder of the coal-tar colour industry, and President of the Society in 1907.

This medal is awarded for discoveries or work of outstanding importance in connection with the tinctorial arts.

LIST OF RECIPIENTS

1908 Professors Graebe and Liebermann. "Synthesis of Alizarin."
1911 Prof. Adolf von Baeyer. "Synthesis of Indigo."
1914 Comte Hilaire de Chardonnet. "Artificial Silk."
1917 Prof. Arthur G. Green. "Primuline."
1919 R. Vidal. "Sulphur Black."
1921 Horace Lowe. "Permanent Lustre on Cotton."
1923 Chas. F. Cross. "Discovery of Viscose."
1925 M. Prud'homme. "Aniline Black and Alizarin Blue."
1928 Dr. Robert E. Schmidt. "For Epoch-making Discoveries of Anthraquinone Derivatives and Dyestuffs therefrom."
1938 Dr. H. Dreyfus. "For Discoveries and Work of Outstanding Importance in Connection with the Development of the Cellulose Acetate Rayon Industry in England."
1938 J. Baddiley. "In recognition of his National Services for the Renaissance of the British Dyestuffs Industry through Many Important Investigations in the Field of Colour Chemistry Conducted or Directed by him."
1950 Prof. J. B. Speakman. "In recognition of his Outstanding Contributions to the Science and Technology of Textiles."
1954 Dr. Arthur Zitscher. "For his Work leading to the Discovery of the New Class of Azoic Dyes, based on the Arylamides of *o*-Hydroxycarboxylic Acids."
1956 Dr. Wallace H. Carothers (posthumous award). "For the Discovery of Nylon."
John R. Whinfield. "For the Discovery of Terylene."

THE MEDAL OF THE SOCIETY OF DYERS AND COLOURISTS

This Medal was instituted by the Society in 1908. Of the competitive designs submitted, that of Mr. Edgar Lockwood was selected. The design indicates that the work of the dyer (centre figure) is both a science (right background) and an art (left foreground).

1908–1927 The Medal was occasionally awarded as a recognition of work of exceptional merit carried out under the Society's Research Scheme.

From 1928 The Medal was awarded as a recognition of exceptional services (*a*) to the Society or (*b*) in the interests of the Tinctorial and Allied Industries.

LIST OF RECIPIENTS

1908 J. B. Fothergill (Bronze Medal). "Treatment of Cotton to Cause it to Resist Direct Dyeing Colours."

1912 J. H. Garner (Silver Medal). "Treatment of Effluents from Dyehouses and Textile Factories."

1928 Ernest Hickson (Gold Medal). "Exceptional Services rendered to the Society as Chairman of the Publications Committee 1897–1925, and Chairman of *Colour Index* Committee."

1930 Arthur Silverwood (Gold Medal). "Exceptional Services rendered to the Society as Honorary Secretary 1913–1930."

1933 Prof. Walter M. Gardner (Gold Medal). "Distinguished Services as Editor of the Society's *Journal* 1900 to 1932."

1934 Prof. F. M. Rowe (Gold Medal). "Exceptional Services to the Society and to the Tinctorial Industries as Editor of the *Colour Index* 1924 and the 'Supplement' 1928."

L. A. Lantz (*Chairman*), H. H. Bowen, P. W. Cunliffe, R. S. Horsfall, Prof. B. A. McSwiney, C. C. N. Vass, C. M. Whittaker, S. G. Barker (Silver Medals). "Exceptional Services to the Society as Members of the Standardisation of Fastness Executive Committee."

1936 W. A. Edwards (Silver Medal). "Valuable Services rendered to the Society as Honorary Secretary of the Midlands Section since its inception in 1919 to 1935."

1937 R. Ritchie (Silver Medal). "Devoted and Valuable Services as Honorary Secretary of the Scottish Section for eighteen years."

1940 F. L. Goodall (Gold Medal). "Valuable Services to the Tinctorial Industries by his work on the Theory and Practice of Wool Dyeing."

1943 C. M. Whittaker (Gold Medal). "In recognition of Exceptional Services in promoting Scientific and Technical Knowledge amongst Textile Colourists, and for Sustained and Outstanding Service to the Society."

1946 H. H. Bowen (Gold Medal). "For Outstanding Services to the Society and in recognition of his Chairmanship of the Publications Committee for a period of twenty years."

H. H. Hodgson (Gold Medal). "For Outstanding Services to the Society and for his series of Sustained Experimental and Theoretical Contributions to those chapters of Organic Chemistry which are the essential scientific background to the Dyestuffs Industry."

E. Race (Silver Medal). "For his Valued Services to the Society as Joint Author of thirteen papers published in the Society's *Journal*."

H. Turner (Silver Medal). "In recognition of his Valuable Services to the Society and of his twenty-two years' service as Honorary Secretary of the Huddersfield Section."

Mrs. E. Cummings (*née* Levin) (Silver Medal). "For her Valued Services to the Society; by her assistance rendered in the preparation of the first *Colour Index*; by her Joint Authorship of a number of Papers published in the *Journal* of the Society, and as an Abstractor for the *Journal* of the Society for twenty years."

1947 Fred Smith (Gold Medal). "For Exceptional Services to the Society over a period of thirty-seven years comprising Chairman, West Riding Section; Member of Council and of many important Committees."

F. Scholefield (Gold Medal). "In recognition of Exceptional Services to the Society in the advancement of Tinctorial Technology both in theory and practice."

C. Schardt (Silver Medal). "In recognition of his Valuable Services to the Society over a period of twenty-four years including Chairman, Vice-Chairman, and member, of the Midlands Section Committee."

1948 G. G. Hopkinson (Gold Medal). "For Valuable Services rendered to the Society and to the Dyeing Industry."

D. B. F. McAndrew (Silver Medal). "For Valuable Services rendered to the Society as Honorary Secretary and Committee Member of the Scottish Section 1935–1947."

C. O. Clark (Silver Medal). "For Valuable Services rendered to the Society from 1923 to 1948."

1949 S. M. Neale (Gold Medal). "For his Pioneer Work in the Application of the Methods of Physical Chemistry to the Elucidation of the Phenomena of Dyeing, more particularly of Cellulosic Materials with Substantive Dyes."

1950 P. W. Cunliffe (Gold Medal). "For Outstanding Services to the Society and to the Tinctorial and Allied Industries."

H. Foster (Gold Medal). "For Outstanding Services to the Society."

L. A. Lantz (Bar attached to Silver Medal previously awarded). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries in connection with Fastness Tests."

1951 W. Kilby (Gold Medal). "For Work on the Development of a Molten Metal Process of Continuous Dyeing."

1953 H. A. Turner (Gold Medal). "For his Valuable Researches contributed to the Tinctorial Industries."

A. W. Carpenter (Silver Medal). "For Valuable Services to the Society."

Miss M. Forbes (Bronze Medal). "For Valuable Services to the Society."

H. R. Hadfield (Bronze Medal). "For Valuable Services to the Society."

1954 G. S. J. White (Gold Medal). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries."

C. C. Wilcock (Silver Medal). "For Exceptional Services to the Society and to the Tinctorial and Allied Industries."

1955 J. Porter (Silver Medal). "For Outstanding Services to the Society, notably in the Inauguration and the Development of the Northern Ireland Section."

1956 P. W. Cunliffe (Bar to Gold Medal). "For Continued Valuable Services to the Society as Chairman of the Fastness Tests Co-ordinating Committee."

H. W. Ellis (Silver Medal). "For Valuable Services to the Society as Honorary Secretary of the London Section 1938–1954."

J. G. Grundy (Silver Medal). "For Valuable Services to the Society as Chairman of the Washing Fastness Subcommittee."

K. McLaren (Silver Medal). "For Valuable Services to the Society as Honorary Secretary of the Fastness Tests Co-ordinating Committee."

M. E. Probert (Silver Medal). "For Valuable Services to the Society as Chairman of the Bleaching Fastness Subcommittee."

J. V. Summersgill (Silver Medal). "For Valuable Services to the Society as Honorary Secretary of the Publications Committee from 1945 to date."

E. Wilson (Silver Medal). "For Valuable Services to the Society as Chairman of the Alkaline Milling, Burnt-gas Fumes, and Perspiration Fastness Subcommittees."

1957 C. O Clark (Gold Medal). "For Outstanding Services to the Society."

THE WORSHIPFUL COMPANY OF DYERS RESEARCH MEDAL

The Medal represents the Arms of the Worshipful Company of Dyers of the City of London, which were granted in 1471. The following is a brief description—

Arms— Sable, a chevron engrailed argent, between three bags of madder of the last, corded or.

Crest— On a wreath three sprigs of the graintree erect vert, fructed gules.

Supporters—Two leopards rampant gardant argent, spotted with various colours; fire issuing from their ears and mouth proper, both ducally crowned or.

Motto— Da Gloriam Deo.

1— The Dyers' Company offer annually a Gold Medal called "The Worshipful Company of Dyers Research Medal", the award of which is open to the Authors of papers embodying the results of scientific research or technical investigation connected with the tinctorial arts submitted to the Society of Dyers and Colourists, and published in the *Journal* of such Society during the twelve months ending on the 30th June in the year for which the Medal is granted, and, in the special circumstance provided for by Rule 6, during the twelve months ending on the 30th June in the year previous to that for which the Medal is granted. If a paper shall be published in two or more parts, then for the purpose of the award of the Medal, all the parts together shall be treated as a paper published in the year in which the final part is published.

2— The Medal will not be awarded to the same person on more than one occasion.

3— The Society of Dyers and Colourists shall consider the papers available for the Medal and advise the Company as to the merits thereof, and if, in the judgment of the Society, none of the papers is of sufficient merit, the Society may recommend that the Medal be not awarded.

4— The Dyers' Company will award the Medal either to the Author of the paper which, in all the circumstances, appears to the Company to show the greatest merit, or, in the event of such paper being the work of an Author who has already been awarded the Medal, to the Author of the paper next in order of merit who has not already been awarded the Medal, and may, if the Company so thinks fit, refrain from making any award.

5— In the event of a paper being the work of two or more persons, the Author shall be taken to be that one of them whose work in the opinion of the Society of Dyers and Colourists has most substantially contributed to the merit of the scientific research or technical investigation embodied in such paper.

6— In the event of the Author of a paper of sufficient merit published in the *Journal* of the Society of Dyers and Colourists during any twelve months for which the Medal is awarded being unsuccessful in obtaining the award of the Medal for that period, the Society of Dyers and Colourists may, in their discretion, consider such paper for adjudication with the papers available for the award of the Medal for the next succeeding twelve months.

LIST OF RECIPIENTS

1908 Prof. E. Knecht. "A Means of Estimating the Degree of Mercerisation in Cotton Yarns."

1909 Prof. Arthur G. Green. "The Chemical Technology of Aniline Black."

1910–11 R. L. Taylor. "The Action of Carbon Dioxide and of Air on Bleaching Powder."

1911–12 W. Harrison. "The Electrical Theory of Dyeing."

1912–13 S. H. Higgins. "Observations on the Bleaching of Cotton" and "The Action of Neutral Salts on Bleaching Solutions."

1913–14 W. Johnson (in conjunction with Prof. Arthur G. Green, who had already been awarded the Medal). "The Constitution of Aged and of Bichromate Aniline Blacks."

1914–15 Morris Fort. "The Mechanism of the Acid Dyebath."

1915–16 James R. Hannay. "The Interaction between Metallic Copper and certain Dyes of the Thiazine, Oxazine and Azine Series."

1916–17 Prof. H. M. Dawson. "The Phenomena of Acid Catalysis and the Theory of Acids."

1917–18 L. G. Radcliffe. "The Sulphonation of Fixed Oils."

1918–19 Chas. F. Cross (Diplomas presented to M. C. Lamb and C. V. Greenwood as co-authors). "Colloidal Tannin Compounds and their Applications."

1919–20 A. E. Everest (Diploma presented to A. J. Hall as co-author). "The Tinctorial Properties of some Anthocyans and certain Related Compounds."

1920–21 Prof. G. T. Morgan. "The Co-ordination Theory of Valency in Relation to Adjective Dyeing."

1921–22 S. Judd Lewis. "On the Fluorescence of Cellulose and its Derivatives."

1922–23 Prof. Arthur G. Green (Bar attached to Medal previously awarded), and K. H. Saunders. "The Ionamines— A New Class of Dyestuffs for Cellulose Acetate Silk."

1923–24 S. Judd Lewis (Bar attached to Medal previously awarded). "The Quantitative Determination of the Fluorescent Power of Cellulose and its Derivatives."

1924–25 Prof. F. M. Rowe (with Diploma to Miss E. Levin, as co-author). "The Identification of Azo Colours on the Fibre and of Azo Pigments in Substance."

1925–26 H. H. Hodgson. "Behaviour of the Sulphides of Sodium in Aqueous and Alcoholic Media", and "The Action of Sulphur on the Monochloranilines."

1926–27 Prof. F. M. Rowe (Bar attached to Medal previously awarded) and Diplomas awarded to collaborators— Miss E. Levin, A. C. Burns, J. S. H. Davies, and W. Tepper. "A New Reaction of Certain Diazosulphonates derived from β-Naphthol-1-sulphonic acid, leading to the preparation of Phthalazine, Phthalazone and Phthalimidine Derivatives."

1927–28 No award.

1928–29 F. Scholefield (with diplomas to Miss E. Hibbert and C. K. Patel as co-authors). "The Action of Light on Dyed Colours."

1929–30 H. H. Hodgson (Bar attached to Medal previously awarded). "Colour and Constitution from the Standpoint of Recent Electronic Theory."

1930–31 Prof. F. M. Rowe (Second Bar attached to Medal previously awarded), and Diplomas awarded to S. Ueno and F. H. Jowett as collaborators. "Insoluble Azo Colours on the Fibre and Action of Boiling Caustic Soda thereon."

1931–32 No award.

1932–33 Two awards— W. T. Astbury. "The X-Ray Interpretation of Fibre Structure."
J. B. Speakman. "The Structure of the Wool Fibre; its Relation to the Dyeing and Finishing Processes of the Wool Textile Trade."

1933–34 No award.

1934–35 H. A. Turner, and Diplomas awarded to G. M. Nabar and F. Scholefield, as co-authors. "The effect of Reduced Vat Dyes upon the Hypochlorite Oxidation of Cellulose."

1935–36 Prof. F. M. Rowe (Third Bar attached to Medal previously awarded), and Diplomas awarded to C. H. Giles, R. L. M. Allen, W. G. Dangerfield, and Glyn Owen, as collaborators. "Decomposition of Azo Dyes by Acids, Caustic Alkalis, and Reducing Agents."

1936–37 J. B. Speakman (Bar attached to Medal previously awarded), and Diplomas awarded to C. S. Whewell and J. L. Stoves, as collaborators. "The Reactivity of the Sulphur Linkage in Animal Fibres."

1937–38 Prof. F. M. Rowe (Fourth Bar attached to Medal previously awarded), and J. B. Speakman (Second Bar attached to Medal previously awarded), and Diplomas awarded to E. Race and T. Vickerstaff, as collaborators. "The Unlevel Dyeing of Wool with Acid and Chrome Dyes. Part I— The Reasons for the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure, and Part II— A Method for Correcting the Uneven Dyeing Properties of Wool Staples and of Cloth Damaged by Exposure."

1938–39 No award.

1939–40 T. H. Morton, as senior author of the paper on "Application of Vat Dyes to Viscose Rayon", by J. Boulton and T. H. Morton.

1940–41 No award.

1941–42 T. Vickerstaff, as senior author of the paper on "The Dyeing of Cellulose Acetate Rayon with Dispersed Dyes", by T. Vickerstaff and E. Waters.

1942–43 No award.

1943–44 J. Boulton. "The Importance of Dyeing Rate— an Interpretation for the Practical Dyer of Recent Research on Direct Dyeing."

1944–45 No award.

1945–46 No award.

1946–47 H. Phillips, as senior author of the paper on "The Chemical Constitution and Physical Properties of Bisulphited Wool", by E. G. H. Carter, W. R. Middlebrook, and H. Phillips.

1947–48 J. M. Preston. "Some Factors affecting the Dyeing of Viscose" and "Some Aspects of the Drying and Heating of Textiles".

1948–49 H. Lindley, as major contributor to the paper "The Mechanism of Set and Supercontraction in Wool Fibres", by S. Blackburn and H. Lindley.

1949–50 No award.

1950–51 J. Crank. "The Diffusion of Direct Dyes into Cellulose. III— The Present State of the Theory and its Application".

1951–52 H. Hampson. "Advances in the Application of Vat Dyes to Viscose Rayon Cakes".

1952–53 R. H. Peters, as senior author of the paper on "The Reduction Properties of Vat Dyes", by W. J. Marshall and R. H. Peters.

1953–54 R. J. Hannay, as senior author of the papers "A New Method of pH Control in Dyeing and Some Observations on the Metachrome Process", by R. J. Hannay, W. H. Major, and R. Pickin, and "The Use of Hydrolysable Esters in the Control of Dyebaths", by R. J. Hannay and W. H. Major.

1954–55 C. H. Giles, as senior author of the papers "A Study of Certain Natural Dyes. I— The Adsorption of Brazilwood and Logwood Colouring Matters by Fibres", by F. M. Arshid, J. N. Desai, D. J. Duff, C. H. Giles, S. K. Jain, and I. R. Macneal, and "II— The Structure of the Metallic Lakes of the Brazilwood and Logwood Colouring Matters", by F. M. Arshid, R. F. Connelly, J. N. Desai, R. G. Fulton, C. H. Giles, and J. C. Kefalas.

1955–56 C. L. Bird, as senior author of the series of papers on "The Dyeing of Acetate Rayon with Disperse Dyes".

THE WORSHIPFUL COMPANY OF FELTMAKERS RESEARCH MEDAL

The Feltmakers' Company offer annually a Gold Medal for Papers embodying the results of scientific research or technical investigation connected with the art of feltmaking and published in the *Journal* of the Society.

1945–1957 No award.

KNECHT MEMORIAL FUND

A Fund of £100 was subscribed as a Memorial to the late Professor Edmund Knecht, from the interest on which two prizes, in the form of books, are awarded annually to selected students of the Manchester College of Science and Technology and the Royal Technical College, Salford.

MERCER LECTURE

A sum of £20 per annum is being given to the Society for a limited period of years in commemoration of the centenary of the discovery of mercerisation. Suitable lecturers are invited to give a Mercer Lecture annually.

1944 N. G. McCulloch, B.Sc., F.S.D.C., and G. S. Hibbert, M.Sc., F.S.D.C. "Science in an Old Industry."

1945 G. S. J. White, M.A., F.T.I., F.S.D.C., and T. Vickerstaff, M.Sc., Ph.D., F.S.D.C. "Colour."

1946 D. Entwistle, B.Sc., A.R.I.C. "Regenerated Fibres from Natural Polymers."

1947 E. J. Bowen, M.A., D.Sc., F.R.S. "Colour and Constitution— The Absorption of Light by Chemical Compounds."

1948 F. Farrington, B.Sc., F.R.I.C., F.S.D.C. "Textile Printing."

1949 E. Wilson, B.A., F.S.D.C. "Some Applications of Chemistry to Textile Finishing."

1950 A. B. Meggy, Ph.D., A.R.I.C., F.S.D.C. "Some Recent Developments in the Theory of Dyeing."

1951 D. Traill, Ph.D., F.R.I.C., F.T.I., F.S.D.C. "Some Trials by Ingenious Inquisitive Persons— Regenerated Protein Fibres."

1952 F. C. Wood, M.Sc., Ph.D., F.R.I.C., F.T.I., F.S.D.C. "Non-felting Wool and Wool Mixtures."

1953 J. R. Blockey, M.Sc., F.R.I.C., and D. H. Tuck, A.L.C. "The Coloration of Leather."

1954 N. W. Yelland, B.Sc., A.R.C.S., D.I.C. "Physics in the Dyeing, Printing, and Finishing Industries."

1955 G. Landells, Ph.D., A.R.I.C., F.S.D.C. "Modern Resin Finishing."

1956 R. K. Fourness, B.Sc., F.R.I.C., F.S.D.C. "Disperse Dyes— Their Development and Application."

1957 J. S. Ward, B.Sc. "The Influence of Fibre Types on Dyeing Methods."

GEORGE DOUGLAS LECTURE

A sum of £2000 was given to the Society by the Bradford Dyers' Association Ltd., the income from the investment of which is employed in providing a biennial lecture on some subject connected with the colouring or finishing of textiles.

1949 H. Levinstein, M.Sc., Ph.D., M.I.Chem.E., F.R.I.C., F.S.D.C. "George Douglas, His Times, and Some Thoughts on the Future."

1952 R. Hill, Ph.D. "Synthetic Fibres in Prospect and Retrospect."

1953 T. Holbro, Ph.D. "The Search for New Dyes in relation to Modern Developments in the Textile Field."

1957 G. S. J. White, M.A., F.T.I., F.S.D.C. "Dyeing— The Apotheosis of Synthesis or a Team playing for its Colours against White."

Proceedings of the Society

The History and Development of Compressive Shrinkage

F. V. DAVIS

Meeting of the Manchester Section held at the Textile Institute on 12th April 1957, Mr. J. W. Reidy in the chair

An account is given of the origins and development of machines for compressively shrinking cloth, and of the utilisation of such machines for special finishing effects. The main emphasis is on the Bradford Dyers Association Ltd. machine in its various forms.

Though it is well known that since the 1930s two systems of controlled compressive shrinkage have been in use by textile finishers, published information has been almost entirely concerned with one of them— Sanforized. As typical of the position, in an AATCC Symposium on Shrinkage in 1954, a paper by L. S. Lang [1] on *Cotton Shrinkage and its Control* described Sanforized but never mentioned the existence of Rigmel; of the new rubber-belt Cluett, Peabody Inc. machine he observed—

> This is the first rubber-belt machine in the world which can shrink a fabric a definite pre-determined amount up to 2½ inches per yard, at speeds as high as 100 y.p.m.

Only in the discussion was the existence of Rigmel acknowledged, when a questioner asked—

> How does the method patented and used by Bradford Dyeing Associates both in England and America compare with the Sanforized process? Does Bradford's system use a rubber belt?

The reply was—

> The Bradford System is called Rigmel, and it does use a rubber belt. It is a very slow process, and requires highly-skilled operators to set that machine to get the proper result and control. It does not compare with our newly-developed rubber belt machine.

I propose to try to correct this situation, by dealing primarily with the Bradford Dyers Association Ltd. (B.D.A.) system, and here I must gratefully acknowledge that I have had the benefit of authoritative statements from the surviving inventor, Mr. Alexander Melville, on the origins, legal background, and so on, from his personal records and recollections.

First, to define the problem briefly. Cotton fabrics are customarily handled in long lengths, so that sheer weight of fabric tends to stretch them lengthwise, and many operations such as tin-drying or calendering may apply warp tension. In many cases the warp tension during weaving is higher than the weft tension, so that the fabric starts life with a tendency to show warp shrinkage. On a finished cotton fabric being washed, there is relaxation of these tensions, and a tendency to equalise warp and weft crimp, so that if the washing and drying are perfectly slack, shrinkage occurs. This is not the whole story, because slack-finished cotton fabrics still shrink on several launderings. Cotton cellulose swells on immersion in water, and in hot alkaline detergents. The fibres, and hence the yarns, increase in diameter. The yarn lengths do not increase, rather do they tend to decrease; but in effect, considering one set of yarns, the same length has to assume a greater sinuosity, so that they pull the other set of yarns closer together. On drying, the swelling disappears, but there is no positive force to reverse the drawing-together, so that the shrinkage remains. Another point is that, while a single fibre, on swelling, does not contract very much in length, yet in a twisted yarn the swelling of the component fibres does tend to cause yarn contraction. These processes cause shrinkage of fabric, until, after several washing and drying sequences, an equilibrium state is reached.

Older methods of trying to deal with the situation were—

(*a*) To make garments larger than their stated (or required) size, so that after 3–4 launderings they were a proper fit— always rather uncertain, and a cause of discomfort or annoyance initially.

(*b*) To make up garments and to launder them before sale, marking them with the size obtained after laundering. This is still used for certain types of garments.

(*c*) To finish cloth on an overfeed stenter. This is merely a device for allowing cloth to shrink warpways during its final drying, and its success depends partly on proper balance of the warp overfeed and weft stretch. Even if by this means one could eliminate processing extensions entirely, it would still not deal with shrinkage due to alternate wetting and drying— swelling and deswelling. Until recently only applicable to pin stenters, but overfeed on clip stenters is now possible.

The problem of finding a practicable finishing treatment had occupied many minds, and as is so often the case, two working solutions were found almost simultaneously— by Sanford Cluett and Cluett Peabody Inc. in America, and by Wrigley and Melville of the B.D.A. in this country. The investigations were entirely independent: neither side knew of the other's work, and the filing dates of the patent specifications were very close. The United Kingdom application date of the former was 20th November 1930; and of the latter 10th February 1931. Wrigley was, of course, a chemist, and had tried to find a chemical answer to the problem, without success. He put it up to Melville, an engineer. Melville gives the origin of Rigmel in this manner—

One evening in 1930 he put a handkerchief on a polished table; took a 4-in. draughtsman's rubber and bent it U-shaped; pressed the bent and stretched part down on to the handkerchief; then straightened the rubber while maintaining downward pressure. On examining the handkerchief, crinkles round the outside of the part under the rubber showed that the part under the rubber had been compressively shrunk.

It was quickly decided that the best method of exploiting this basic invention was to use a round rubber sleeve forced into an elongated oval, so that the rubber surface at the rounded ends was stretched, and that on the flat parts contracted. A small model machine was soon constructed, and the first trial made before it was actually finished. A fabric with a 5% laundry shrinkage was found to have contracted 6% by passage through the machine, the cloth adhering to the rubber and slipping on the smooth, polished pressure plate. It is interesting to note that, in his home experiment, if Melville had used a rough surface instead of a polished table, the experiment would in all probability have failed. The basic B.D.A. patent [2] followed, and is dated 10th February 1931.

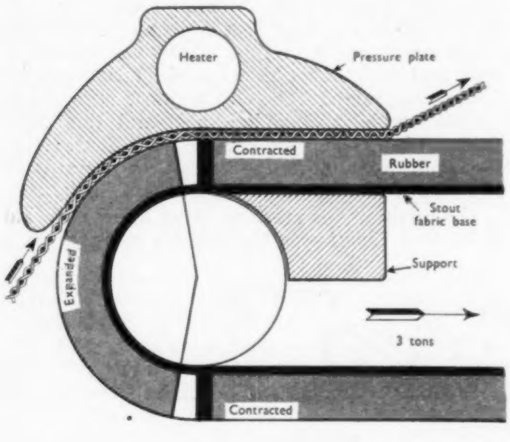

FIG. 1—Plate Machine

The principle of the works machine is shown in Fig. 1. The shrinking element consists of a rubber sleeve of rather more than 1 in. thickness on a stout canvas base, passing over two metal rollers held apart by a high tension (about 3 tons), so that the rubber sleeve is flat except where it conforms to the roller curvature. If one marks out equal lengths along the canvas base, these remain the same where the sleeve conforms to the roller and on the flat parts. But the rubber itself deforms, and if equal lengths are marked on the rubber face, they expand where the rubber is bent. Cloth is pressed against the rubber face by a carefully ground and polished pressure plate which has an internal heater. The cloth enters where the rubber surface is bent and expanded (just before the 10 o'clock position); it adheres to the rubber but slips on the pressure plate. At the point where the rubber straightens (length element coloured black) the rubber surface contracts to normal and forces the cloth to contract with it. The whole compressive shrinkage thus occurs over a very short length and in a very short time. To ensure stability, the pressure plate is carried backwards over the flat rubber for a distance, with a flat metal support beneath the rubber sleeve to maintain pressure. The machine is small and compact, being only 4 ft. in overall length; the distance from front of front roller to back of back roller is only 2 ft. 3 in., the roller diameters being 8 in. The only addition is a small Palmer drier with a felt blanket, placed behind the shrinking unit; its cylinder diameter may be only 2 ft., and it plays no part in the shrinkage. Its main purpose is to complete the drying and setting of the cloth, but it can be used as a means of control in that if the unit inserts 6% shrinkage, and only 4% is required, that result is obtained by running the Palmer 2% faster than the shrinking unit, and so extending the shrunk cloth 2%.

The first full-size machine was made in the B.D.A. Central Workshops, and by working night and day seven days a week it was completed in 2 months. The pressure plate has to be ground to fit the rubber sleeve under tension: it is not a simple arc of a circle followed by a flat. This is due to the peculiar changing distortions in rubber, which is deformable when unconfined but practically incompressible when rigidly confined. This machine, known as the "Plate machine", was designed primarily for the poplin trade, and gives compressive shrinkages of 3–6%.

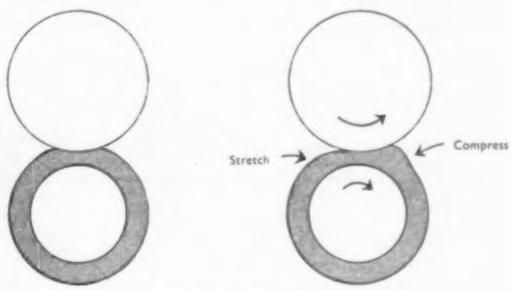

FIG. 2—Differential Machine

The exact ratio between roller diameter and sleeve thickness to obtain a desired contraction is not found by calculation alone, again because of the peculiar behaviour of rubber. As an example of this, if a simple nip consists of a hard (metal) bowl and a soft rubber bowl, the latter does not simply flatten at the nip when the system rotates: the rubber is stretched and thinned before and at the nip, and thickens and contracts behind it, forming a "hump". Fig. 2 is, of course, exaggerated. This arrangement will compressively shrink cloth, and was specifically covered by Wrigley and Melville's patents [3]. The same principle is made use of in the latest Cluett Peabody rubber-belt machine.

In the plate machine, the pressure plate is heated to 200–300°F. and its temperature is thermostatically controlled. Goods are normally damped so as to contain 10–15% moisture. There is some control of shrinkage by variation of temperature, and roughly a cloth which shrinks 6% at 250°F. will shrink only about 3% at 200°F. Production speed is 30 yd./min. or greater. Useful life of the rubber sleeve is about a million yards, but this depends on how the machine is used. With continuous operation on a shift basis there is considerable heat build-up in the rubber; a sort of fatigue effect occurs, and the rubber may separate from the canvas, or begin to break up internally, in a relatively short period.

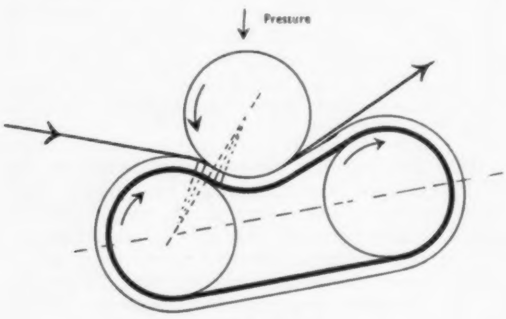

FIG. 3—Heavy-duty Machine

For the heavier trade, the pressure roller replaced the pressure plate, and the heavy-duty machine was developed. This gives two stages of contraction on one sleeve, as the rubber passes from curvature to flat to reverse curvature, so that the fabric is applied where the rubber is expanded on the face, and leaves where it is contracted on the face (Fig. 3). This machine is capable of shrinkages of up to 17% or so. The pressure plate is replaced by a polished pressure roller, and the actual pressure applied to this has to be much greater than that applied to the pressure plate, in order to deflect the rubber sleeve properly. The drive is through the pressure roller, not through the end-rollers, and the pressure roller is, of course, heated, usually by steam. In contrast to the plate-type machine, pressure variation is the main means of control. A small Palmer is used after the unit, to dry and set the cloth, and it may also be used to remove excess shrinkage if desired, i.e. it may be a second means of control. Running speed is up to 60 yd./min.

The Cluett Peabody machine (Fig. 4) is based essentially on the Palmer or blanket drier, and as developed by Cluett uses a wool blanket. When such a blanket is bent round a cylindrical roller, the centre line stays constant; the outer face expands, and the inner face contracts. Cloth is fed on to the blanket where it is bent round a small-diameter intake roller, and it is held against the expanded blanket face by heated metal shoes, which are brought right down to a sharp edge at the surface of the large heated drum. Reversal of curvature occurs at the line joining the centres of drum and intake roller, the expanded face becoming slightly contracted. The cotton fabric is forced to contract with the blanket face, and this compressive shrinkage is set in the cloth as it traverses the large drum, heated by steam at upwards of 15 lb./sq.in. pressure and held by the blanket.

The origin of the machine as we know it is said to be that Cluett was treating his material on a

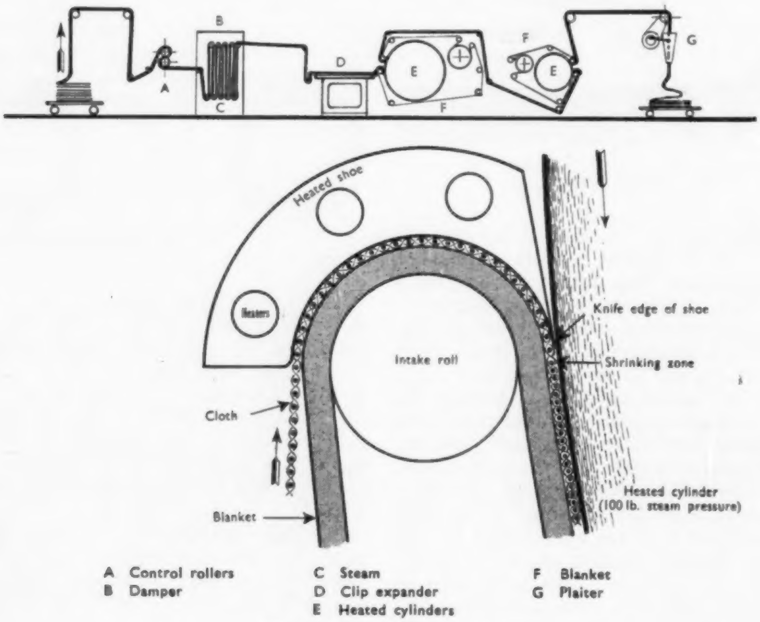

FIG. 4—Cluett Peabody Machine

Krantz overfeed stenter. This gave crinkled selvedges, and he put the cloth through a Palmer afterwards, to flatten the selvedges. He noticed that the fabric tended to balloon back from the nip, and this led him to the idea of putting shoes over the intake roller, to force the cloth to adhere to the blanket. The exploitation of this arrangement as a compressive-shrinkage device in its own right followed, and was partly due to the fact that Krantz was opposing Cluett's use of his overfeed.

The Cluett Peabody machine requires a higher moisture content in the cotton than does the B.D.A. machine, and this must be uniform, or else cloth distortions arise. The moisture addition is by water or steam sprays in a chest. One reason for the necessity for this extra moisture is that in the B.D.A. machine moisture vapour is trapped between impervious metal and rubber, whereas in the Cluett Peabody machine moisture vapour is driven into the porous blanket by the heated drum, and is lost. A short clip frame or stenterette comes between the spray chest and the main Palmer drum, to present the cloth to the latter at the desired width. The main drum may be 84 in. in diameter. A second auxiliary Palmer is placed back to back with the first. It may play no part in the shrinking, or (if fitted with heated shoes) may act as an auxiliary shrinker. In the first case, its use is to equalise the surface appearance of the cloth, and to complete drying and setting. Control (below the maximum shrinkage produced by the blanket in use) is effected by varying the speed of the control rollers at the front and the speed of the second Palmer. By either holding cloth back at the control rollers, or running the auxiliary Palmer faster than the main one, shrinkages less than maximum are obtained. A typical range is 45 ft. long, excluding plaiting gear.

The Cluett Peabody process (because of the textured wool blanket) gives a comparatively rough finish, preferred for e.g. overalls. The B.D.A. process gives a smooth, soft, silky finish, ideal for poplins. It preserves "bottom finish" on fabrics where Sanforized tends to remove it, owing to the behaviour of rubber under pressure, and to the much lower moisture content of the fabric. Shrinking and drying do not occur simultaneously in the B.D.A. process.

When it became known to the two parties that the two systems had been patented, legal action at once followed, each party endeavouring to restrain the other. Cluett had the advantage of a slightly earlier date for his patent, but his basic mechanism—the Palmer drier—was well known, and many finishers were aware that it tended to shrink goods when used as a drier. The B.D.A. system was based on the unique behaviour of rubber, and Cluett was not at that time prepared to agree that rubber would work. Nowhere in his specifications is it mentioned. The position was actually reached that the contending parties were in the British Patent Office with counsel for both parties awaiting the hearing when an understanding was reached.

Here matters rested until the patents expired, the basic B.D.A. specification finally expiring on 17th November 1949. During that time there was only one infringement in Great Britain, and this was settled by the infringer undertaking to dismantle his machine. Various later patents by other people, trying to circumvent the B.D.A. patents, became void. The only serious infringement was in Canada, and this was taken to court, with both Sanford Cluett and Alexander Melville appearing as expert witnesses against the infringer. The action was heard in Ottawa in 1936, and the judge ruled that both the Cluett and the B.D.A. patents had been infringed. Damages were awarded, and the infringer took out a licence; his own patent[4] was made void by the Court's ruling. The apparatus was very similar to the present Cluett rubber-belt machine.

After the expiry of the B.D.A. patents, the machine has been made for the finishing trade generally by Messrs. Hunt & Moscrop Ltd. under the name "Evaset", in both plate and heavy-duty forms. Over 100 Evaset machines have so far been made, and sold to countries all over the world, suggesting that they are not such unsatisfactory machines as Lang would lead one to imagine. *Rigmel* remains, of course, a registered trade mark, the property of B.D.A.

At the same time, the expiry of the B.D.A. patents left Cluett Peabody free to exploit rubber sleeves or belts, and this they have done by using rubber belts on a modified Palmer type of machine. No heated shoes are required, as the action of the machine is based on the distortions of rubber, and in essence the principle is the same as that of the B.D.A. differential machine (Fig. 5).

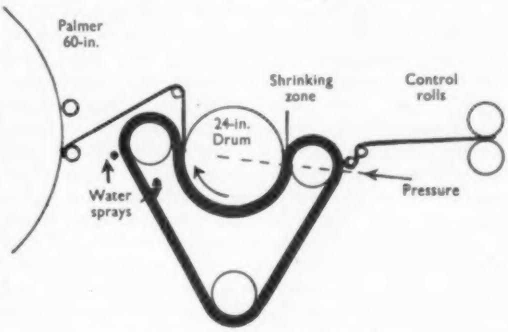

FIG. 5—Cluett Peabody Rubber-belt Machine

Instead of the single nip between a smooth metal and a soft rubber bowl, a rubber belt some 13 ft. long and either $2\frac{1}{16}$ or $20\frac{3}{4}$ in. thick is pressed against the main drum by a pressure roller. Sufficient pressure is applied to "thin" the rubber by about $\frac{1}{4}$ in. (or $\frac{1}{2}$ in. on the thicker belt, for high shrinkages), thereby expanding the rubber surface before the nip. The cloth is nipped on this expanded surface. Where it leaves the nip, the rubber thickens and the surface contracts, thus causing cloth shrinkage. The belt is cooled by means of water sprays as it leaves the drum, and the water is removed by passing the belt through two rollers as it returns to the pressure roll. The thinner belt will shrink cloth 10–12%, and the thicker one up to 20%. Where shrinkages less

than these values are required, control is effected (as on the blanket machine) by running control rolls at the beginning of the range at a slower speed than that of the drum, or by running the drying-and-setting Palmer after the drum at a higher speed than that of the drum.

Whatever the system used, the method of working is in general the same. A standard wash test is carried out on the untreated material, to determine its shrinkage. Then the machine is set so that it compressively shrinks the fabric by that amount, a tolerance of up to $\pm 1\%$ being allowable. On a subsequent wash test, the normal laundry shrinkage occurs, but the compressive shrinkage is removed, so that the outward effect is that the warp length remains unchanged within 1%. The processes stand or fall on the results of one standard laundry wash test. But, as mentioned earlier, fabrics often shrink further after the first wash, though to a lesser extent, and the ultimate shrinkage may be twice that obtained on the first wash, or even more. It is well known that the manner of drying plays a part here, and that tumbler-drying in particular may cause shrinkage of compressively shrunk goods which is well outside the 1% allowed tolerance. The only answer at present seems to be to combine compressive shrinkage with a resin stabilising finish, either urea–formaldehyde, hydroxymethylmelamine, or other types of resin. This is acceptable only in a minority of cases, either on the grounds of effect on handle, wear, etc. or more commonly on price grounds.

In this connection, it must be mentioned that within the last few years there has been interest in applying a thermosetting resin precondensate to cotton, and after drying to a controlled moisture content, compressively shrinking the goods and then heat-curing to polymerise the resin, thus fixing the mechanically applied compressive shrinkage. This, having the sequence— resin-impregnate, mechanically treat, heat-cure— falls under the Bancroft Everglaze patents [5], and is one method of producing minimum-iron finishes under the name of *Minicare*. It is immaterial which compressive-shrinkage system is used, provided that excessive shrinkage is not applied, but the rubber-belt machines give a smoother, softer, and more lustrous result than the wool-blanket Cluett machine.

One can print cotton fabrics with a thickened resin precondensate, dry, compressively shrink, cure, and then wash, so that the compressive shrinkage is lost except in the printed areas. With warp stripes, this is one method of producing plain coloured stripes on a crimped white ground (the opposite way to a normal "caustic crimp" print). With uncoloured, very fine, closely spaced stripes, excellent "no-iron" properties and an unobtrusive surface pattern are produced on suitable fabrics. This Aqua-crimp process is covered by patent [6].

It is worth mention, perhaps, that a B.D.A. machine working in reverse will give controlled extension of a fabric, though there are so many well known and highly efficient cloth-stretching machines in a finishing works that the interest is mainly academic!

During 1952 history repeated itself: chance remarks brought to light the fact that once more two organisations, working independently and unknown to each other, had hit on the same basic idea, and had filed patents within a fortnight of one another. Those involved were, on the one hand, C. S. Parker, Alexander Melville, and the Bleachers Assocn. Ltd., and on the other, J. G. Evans, G. Landells, W. Moorhouse, J. R. W. Perfect, and B.D.A. The aim in both cases was to secure decorative effects on plain fabrics by localised, as distinct from all-over, compressive shrinkage. The two organisations agreed to pool their investigations and ideas, and to develop them jointly. Patterns of this new effect were shown at the 1953 British Industries Fair under the name of *Ruffle* finish.

For this effect, the heavy-duty machine is the most suitable, as it will give local shrinkage of a sufficiently high order— 15% or so— to give a clearly defined effect. The aim of the inventions is to interrupt contact of the pressure roller and the rubber sleeve in the shrinking zone, and this may be done either by using a pressure roller built up of spaced ridges in any desired pattern, or by forming depressed ridges in the rubber sleeve. In the former case, compressive shrinkage occurs only at the projecting ridges, and in between the fabric puckers or ruffles, so that the finished effect is of alternate plain and puckered stripes, which may be of any desired width, spacing, and pattern, within reason. If the rubber sleeve is ground with circumferential parallel grooves, the same general effect is secured. If the rubber is moulded or ground with a repeating non-linear pattern, a variety of decorative effects are obtained.

On thermoplastic fibres such as nylon or Terylene, these effects can be heat-set by the heat of the pressure roller, and are durable to normal treatment. On cellulose acetate, pretreatments with various swelling agents have been tried, but Evans and B.D.A. found that by simply damping the cloth to 30% moisture or over, and running it through the machine in that state, excellent effects of good durability were obtained. On cellulose fabrics, they are not inherently durable, and must be fixed with suitable resin finishes, by the sequence— resin-impregnate, apply the differential or local compressive shrinkage, cure in slack state. This sequence clearly falls under the Everglaze patents, and the process was accordingly divulged to Bancroft's, who decided to promote it as Tutored finish.

For these effects, any question of using the rubber-belt Cluett machine is more or less academic, owing to the expense of grooving the rubber belt, or the virtual impracticability of grooving the drum. With the heavy-duty B.D.A. unit, changing the pressure roller for one of different design is a matter of an hour or so only.

I have left till last a further modification of the B.D.A. principle, called the *confining-passage machine*, because it is only now under development, and though the governing patent [7] dates back to 1939, it has been extended for an extra six years. The principle is derived from the original B.D.A. machine. If cloth enters a first nip and leaves at a

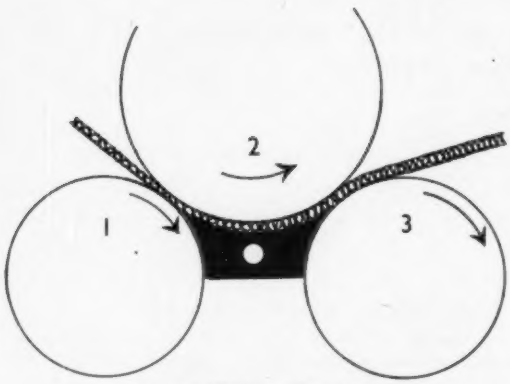

Fig. 6—Confining-passage Machine

second nip which is running more slowly, and the space between the two nips is filled in by two plates forming a confining passage so that the cloth cannot pucker or ripple, then it becomes longitudinally compressed. In a more practical form, there are three rollers, arranged as shown in Fig. 6. All are rubber-covered, but No. 1 and 3 are covered with relatively soft rubber, and No. 2 with hard rubber. Rollers 1 and 2 rotate with the same peripheral speed, but 3 rotates at a lower speed, so that the nip between 2 and 3 exerts a retarding influence. A smooth polished metal block is fitted between the nips, as shown, with its upper curvature approximately that of roller 2. It may be shaped or placed so as to leave a rather wider gap near nip 2–3 than at nip 1–2, so that the cloth may thicken as it shrinks, without jamming. The metal block may be heated. By careful adjustment of the relative hardnesses of the rubber rollers, the difference in speed between roller 3 and rollers 1 and 2, and the spacing of the confining block, very high compressive shrinkages can be produced — of the order of 30% or more. Usually, part of this is recovered or lost almost as soon as the fabric leaves the second nip, but there is a tendency for each individual fabric to settle to an equilibrium state, so to this extent the machine may be said to be self-adjusting. It will compressively shrink wool, whereas normal B.D.A. or Cluett machines will not. It does not, of course, claim to deal with the milling shrinkage of wool. There is no use of changes in curvature, and rubber is not necessary; the grip on the fabric may be obtained by milled or knurled metal rollers instead of rubber-covered rollers.

Although a model machine is in existence, and a full-size machine is under construction for development purposes, it will be some time before such a machine will be generally available. It is a very powerful machine, and its uses will obviously be rather specialised. For example, fabrics of thermoplastic fibres, such as nylon and Terylene, can be simultaneously shrunk some 30% and set, so as to behave as elasticised fabrics with a reversible stretch warpways. Enough has been said, however, to indicate that the potentialities of compressive-shrinkage methods are by no means yet fully worked out.

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Bradshaw Works
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(*MS. received 7th June 1957*)

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Possibilities and Limitations of the Application of Pigments to Textiles

W. KASS

Meeting of the Manchester Section held at the Textile Institute on 14th December 1956, Mr. J. W. Reidy in the chair

The fixation of pigments on various types of fibres by means of synthetic resins is discussed, and the advantages and disadvantages of this type of process are considered.

Introduction

This paper will be confined to a consideration of the fixation of pigments with the aid of synthetic resins. Only those products will be discussed which are already in practical use.

Over the past twenty years vast strides have been made in the techniques of manufacture and application of both pigments and binders. Apart from the frequent superiority in light and wet fastness properties, many pigments have greater brilliance than most of the conventional dyes. This, however, is only one of the reasons why they have become more and more popular, and the major reason is that their application does not require elaborate equipment, and in many cases it is possible to eliminate any wet aftertreatment.

To understand better the technical conditions of application the chemical and physical properties of binders and pigments will be described.

A— Binders

The most important types of resins suitable for the fixation of pigments are— (i) phenol–formaldehyde, (ii) urea–formaldehyde, (iii) melamine–formaldehyde, (iv) alkyds, (v) vinyl, acrylic, and styrene resins, (vi) synthetic latices, and (vii) polyurea and polyurethan resins. Such a resin is rarely used alone as a pigment-binding agent, but usually in combination with at least one other resin, and such special ingredients as softeners, catalysts, thickeners, defoamers, and emulsifiers are added.

Synthetic latices are emulsified forms of resins and can contain butadiene, neoprene, other unsaturated hydrocarbons, such as chlorinated or unchlorinated ethylene and propylene, as well as acrylic esters, nitriles, salts, and acids.

When these resins are applied to textiles, particularly exacting requirements are demanded from them. Not only is an extremely high fastness to abrasion of the film formed on the fibre necessary, but in addition very specific mechanical properties are desirable. For example, the film must have maximum flexibility in order to cause as little effect as possible on the handle of the substrate, and the film must also remain transparent and colourless.

The mechanical properties of resin films can be modified not only by the degree of polymerisation but also by suitable combination with selected components of the reaction. It is also of importance whether the polymerisation reaction leads to oriented macromolecules or to unoriented straight-chain, branched, or coiled macromolecules.

Linkage of single molecules of the binder components into macromolecules produces a continuous film, which fixes the pigment to the substrate. Macromolecules may be formed by two main types of reaction—

(*a*) ADDITION POLYMERISATION is the formation of large molecules without elimination of any simple molecules, e.g. by conversion of C:C into C·C and in the reaction between *iso*cyanates and polyhydroxy or polyamino compounds. At present it has not been found possible to carry out this reaction successfully on the fibre itself, but several polyaddition products can be applied to the fibre by means of suitable cross-linking agents. The formation of a polyurethan can be taken as an example of polyaddition.

(*b*) CONDENSATION POLYMERISATION takes place by the splitting off mostly of water, alcohol, or other simple molecules (e.g. formation of urea–formaldehyde resins and polyesters). This endothermic reaction often requires catalysts and high temperatures in order to shift the reaction equilibrium in the required direction and to produce the necessary speed of reaction.

A distinction should be made between the application of products of low degree of polymerisation, which link directly with reactive groups in the fibre, and the application of highly polymerised substances, which are cross-linked to the fibre by special components.

Present knowledge of the application of pigments and resins to textiles is based mostly on empirical experience. There have consequently been difficulties in explaining apparently contradictory observations, and an investigation was carried out to find some fundamental laws which would help in assessing the possibilities and limitations of this very complex problem.

B— Pigments

The suitability of a pigment, either organic or inorganic, for use in the textile field is governed by several factors, such as— particle size, degree of dispersion, electrical charge, specific gravity, hardness, and solubility. The definition of a pigment includes the property of general insolubility, and almost complete insolubility in water is commonly understood. A further valuable property is insolubility in the solvents normally used in dry cleaning, e.g. white spirit, trichloroethylene,

perchlorethylene, and carbon tetrachloride. Furthermore, the pigment should have good resistance to alkali, acid, chlorine, perspiration, peroxide, and gas fumes. Pigments generally meet these requirements because of their inherent insolubility, which means that the slow reaction between solid and liquid phase, or solid and solid phase, or solid and gaseous phase is the determining factor. Naturally, for the insolubility of the pigment to play its part effectively, the binder also must be insoluble.

The necessary degree of dispersion of the pigments is normally obtained by milling in the presence of an emulsifier or a dispersing agent. However, milling can be carried on only to a certain stage, as overmilling can cause destruction of some of the primary particles and hence loss in brilliance and dulling of the colour. A particularly efficient milling machine is the kneader type, as this results in a highly dispersed and concentrated pigment paste in a minimum time of processing. The particle size of good commercial pigment dispersions lies between 0·1 and 1·0 μ.

Primary particles are the smallest aggregates which are still crystallite units, and their size lies between 0·01 and 0·5 μ. A method of determining the degree of dispersion is by dispersoid analysis, which is based on the determination of the sedimentation equilibrium by application of Stokes' law. The determination is carried out in a measuring cylinder from which, at definite time intervals, and at definite heights in the cylinder, constant volumes of an aqueous suspension of the pigment are removed and their concentrations determined by evaporation.

It appears from practical considerations that the maximum tinctorial value is obtained with particle sizes of 0·2–0·5 μ. The colour also is influenced by particle size: an increase in particle size shifts the wavelength of the reflected light towards the longer waves (towards red), and simultaneously the proportion of grey is increased.

Sometimes agglomeration of the particles takes place after milling and is normally due to the surface potential between the disperse phase and the dispersing medium. The possibility of determining this potential by electrophoresis is purely of theoretical interest. However, from a practical point of view it does explain differences in behaviour between the various pigments (migration, foaming, and agglomeration) on addition of the same kind and quantity of dispersing agent. The electrokinetic potential is normally a function of the viscosity and the dielectric constant of the dispersing agent, and of the charge and the diameter of the pigment particle. The fact that the pigments are mostly negatively charged is explained by selective adsorption of anions. Anion-active dispersing agents therefore increase the negative charge. Free amino groups in the molecule tend to acquire a positive charge, and can therefore neutralise the negative charge, or even lead to positively charged particles.

These relations explain why the pigment pastes have to be adjusted for specific purposes, and particularly why the accompanying binders must be carefully chosen. They furthermore explain why the addition of certain auxiliary products is not effective with all pigments in the same way, or to the same degree. The possibility of combining pigments, produced for use with binders for a definite process, with binders for a different process therefore has distinct limitations. The restriction may not become apparent in a laboratory trial, but may cause considerable trouble in production.

In this connection it should be noted that certain pigment pastes on the market contain all or a part of the binders necessary for fixation, either dissolved or emulsified. Others are pigment preparations free from binders, and therefore less limited for combination with other processes. Pigment pastes designed for use in a process using an oil-in-water emulsion will destroy a water-in-oil emulsion, and *vice versa*, if they are mixed together.

C— Influence of the Fibre on the Process

It is characteristic of the application of pigments to textiles that no direct affinity exists between the fibre and the pigment, and the resins in which the pigments are incorporated form the link between pigment and fibre.

Consequently, it is sometimes assumed that the substrate has no effect on the application of the pigments. In theory this assumption is correct, but in practice considerable variations do result depending on the substrate. The binders are linked to the fibres by different surface attractions, and these attractions are not only specific for the individual fibre, i.e. of different chemical character, but also vary the efficiency of the linkage. They are, roughly speaking, combinations of the following—

(1) Surface tension of padding liquor or printing paste, which affects the wetting properties and consequently the penetration of the fibre.

(2) The capillarity, which is a function of the surface area, the charge, and the chemical character of the fibre, among which there is a certain relationship.

(3) The charge on the pigment and the binding agent. This charge can be due not only to the normal ionic charge, but also to the dipole effect, which is due to intramolecular heteropolarity of the pigment or the binder. Attraction due to anti-parallel electronic spin does not become effective.

The relative efficiency of the different factors will vary considerably from case to case. For example, the capacity of the material to take up water is very much dependent on the nature of the fibre. Fibres of low absorptivity, of course, leave more padding liquor or print paste on the surface instead of absorbing it, and in the print this yields a deep colour provided that the adhesion between fibre and binder is adequate. In the case of most man-made fibres (particularly continuous filament) this is not so.

On fibres of poor absorptive properties the fastness is generally somewhat inferior. A special case is glass fibre: some binders have no adhesion at all,

whereas others give excellent fixation, which is very probably dependent on the electric charge.

D—Practical Consequences of these Theoretical Considerations

1. DYEING

Because the pigments have no affinity for the fibre, and the binding agent has to act as substitute for this affinity, there is no possibility of exhaustion of the dyebath or levelling taking place. The dyeing process consequently does not depend on the time of immersion of the fabric in the dyebath. The only time factor involved is that necessary for complete wetting of the fabric.

Therefore it is apparent that pad dyeing is the most suitable method for use with pigments. The dyeing process is very simple, but application on the pad to ensure satisfactory dyeing necessitates the following conditions—

(*a*) The pad must squeeze evenly. Both rollers should be of the same size and the same hardness. The expression of the fabric should be kept as low as possible.

(*b*) The drying should be carried out evenly and simultaneously from both sides. The most suitable drying equipment is a hot flue, although satisfactory results can be obtained with jet driers. Can drying is possible only when the temperature of the first set of cans can be kept low and the whole range runs fast. Partial drying can be completed without danger on a pin or clip stenter.

For certain styles of work where it is satisfactory to dye only one side of the fabric, the pigment can be applied by means of a cover roller on a printing machine.

2. DIRECT PRINTING

Application of pigments in direct printing is particularly economical because it is possible to eliminate any wet aftertreatment. Particularly where small designs are printed, this advantage becomes more obvious, because the dye consumption is low, and the costs of aftertreatment would be relatively higher.

It always used to be said that in machine printing the reds were not sufficiently brilliant, but recently red pigments have been developed which, even in machine printing, show a brilliance approaching that of the azoic dyes. It should be noted, however, that a certain sensitivity to "crushing" still exists. This sensitivity can be partially compensated by an addition of solids-containing bodies to the thickener. On repeated crushing the print paste is so thoroughly distributed throughout the fabric that there will be no really noticeable stiffening of the handle.

Nearly all the pigment processes have the disadvantage that there is a certain tendency to transfer colour into the next colour box. Where fitting patterns are under consideration a lint doctor will prove of assistance, but for "fall-on" designs it is advisable to use brush furnishers, and to fill up the colour box as often as possible.

When the binders are properly selected, the pigment-printing process gives very level blotches. Furthermore, in reduction they give better yields than most of the conventional dyes.

For many binders baking gives the maximum fastness properties, but in certain circumstances, where this maximum fastness is not required, steaming of these binders gives adequate results. Binders do exist, however, which give their maximum fastness on steaming, drying over cylinders or in the drying chest. This low-temperature curing can obviously be a tremendous advantage where there are bottlenecks in works either in the steaming or the washing department. A great advantage is the ease of colour matching, and the immediate visibility of printing faults at the machine (e.g. doctor streaks, etc.).

Sometimes, when a copper roller and steel doctors are being used, the print paste dries too quickly on the roller, owing to the electrical potential difference and the heat of friction, and results in a certain amount of "scumming". This difficulty can be almost completely eliminated by correct selection of the solvent used in the preparation of the printing emulsion. An addition of mineral oil to the ready-made printing emulsion or print pastes can be of considerable assistance, but the oil must not contain any additives, and should be only slightly coloured. Where high-boiling solvents or white spirit are used, such an addition is not normally required, even when small designs are being printed at high running speeds.

Stability of the print paste and the ease of fixation are inversely proportional. Naturally, print pastes of high stability require high temperatures and the use of catalysts for fixation. Sometimes it is advisable to add the catalyst just before printing, for in some cases print pastes are more stable without the catalyst. When standard styles are being printed at high production rates, there is difficulty in baking the whole production at temperatures of 130°C. or higher, so that binders which can be fixed at normal drying-chest temperatures are most suitable for this type of work.

This easy fixation is considered a disadvantage when printing on cloth back-greys. By correct treatment of the back-greys with suitable detergents at low temperatures, they can be maintained in a soft and absorbent condition.

3. PRINTING ALONGSIDE OTHER DYE GROUPS

In some cases it is desirable to use pigments as supplementary colours to dyes of other groups in a pattern. In bulk production certain precautions are necessary because of the tendency of the pigment pastes to be transferred to the following colour box. It should be ensured that the dyes following the pigments, e.g. vats, Rapidogens (FBy), should not be sensitive to the auxiliaries in the pigment print paste. The use of a starch roller can be advantageous in the case of fall-on designs; fitting patterns require only a lint doctor. In cases where the pigments are printed last, it should be remembered that many pigment binders are sensitive to electrolytes or other ingredients of the other print pastes.

In screen printing, the combination of pigment pastes with other dye groups is less dangerous, provided that they are not printed wet on wet.

4. RESIST STYLES

Pigment processes are in principle suitable for resist printing. However, the binders and resisting agents must be carefully selected. As previously mentioned, there are some binding agents which need acids or acid-forming products for cross-linking, as well as others which can be fixed with alkali or which can have their internal cross-linkage initiated by alkali. The general sensitivity to electrolytes must also be considered.

(a) *Aniline Black (C.I. Pigment Black 1) Resists*

For binders which are stable to alkalis it is possible to use the conventional alkaline resist; in other cases zinc oxide is more suitable. A major difficulty is that most of the emulsifiers which are at present used in the manufacture of the printing emulsions are affected by strong alkalis or zinc oxide, and in some cases become completely ineffective. For this reason emulsion thickeners can be used in very few cases for resists under aniline black, and the solid-containing thickeners are preferable.

These thickeners naturally have the property of swelling when brought into water, and confer swelling properties on the film as well. As a consequence of this, the wet fastness properties will be decreased. In spite of this disadvantage, pigments have become quite popular for resist styles under aniline black. It is of considerable help that these styles normally receive a subsequent starch or permanent finish.

(b) *Resists under Variamine Blue (C.I. Azoic Diazo Components 22, 35, and 47)*

In this case, also, the compatibility of resisting agent and binder must be considered. The use of acids as resisting agents is unsuitable for those binders which are cross-linked by means of acids or acid-forming products, because considerable amounts of acids are necessary to give a good resist under Variamine Blue, and therefore pigment print pastes will coagulate very quickly. Aluminium sulphate is a strong tribasic electrolyte which normally causes precipitation even of those latices which are stable to acids.

Pigments are used successfully for Variamine Blue resist styles in yellows, greens, and bright pale blues. A drawback with yellows is adsorption of dirt or contamination by the binder film. In a contaminated washing liquor a dull greenish yellow is always obtained, unless special precautions ensure good circulation and renewal of the liquor.

(c) *Resists under Fast Colour Salts*

With binders which are not sensitive to stannous chloride which is dissolved or dispersed in hydrochloric or citric acid, very bright and fast effects can be obtained under Fast Colour Salts. However, only the rapid coupling combinations of Naphtols and Fast Colour Salts are suitable, and only those binders can be used which can be fixed at low temperatures, because baking in the presence of stannous chloride would lead to a burnt-out style.

5. PRINTING ON NAPHTHOL-PREPARED GROUNDS

For this purpose also it is advisable to use those pigment binders which are fixed at low temperatures, and preferably cross-linked in the presence of alkalis. Baking at high temperature causes fixation of the naphtholate on the fabric, and consequently the white ground will be yellowish.

6. DISCHARGE PRINTING

Pigments have been used for discharge work on direct-dyed grounds in only a few cases. The main objection to discharge printing with pigments is that during the drying and steaming process some fixation of the binder takes place. The residues of the destroyed direct dye become fixed too, and as they are not always colourless or removable by washing, they will cause a yellowing of pale colours. The reducing agents must be suited to the binder as well. Thus, for instance, hydroxymethanesulfinic (formaldehyde-sulphoxylic) acid is not suitable in an acid medium, and decomposes quite quickly, depending on the temperature. Its zinc salt is sometimes difficult to distribute in the print pastes, and can be the cause of coagulation of binding agents. Formamidinesulphinic acid is suitable and effective in an acid medium, but the discharge effect is not always the same as that obtained with the conventional discharging agents.

The chemical character of the pigment employed is of vital interest in discharge printing, particularly as azoic pigments are sometimes decomposed quite quickly by the reducing agents. The reds are most sensitive in this respect. When pigments prepared from vat dyes are used for discharging, any reduction of the pigment is not important, because it can be reoxidised afterwards. Suitable red pigments with the desirable brightness and fastness to discharge media are not yet on the market. Because in discharge styles steaming and washing are necessary, a vat dye is preferable to a red azoic pigment in that style.

7. SCREEN PRINTING

Pigment processes are especially popular for screen printing because the rate of production is considerably lower than in machine printing, and therefore baking is not such an obstacle. The brilliance of colour with pigments is still higher than in machine printing, and the sensitivity to crushing does not play any part. It is therefore possible to print even a black first, and the other colours will cause only a slight difference in shade, and furthermore improve the fastness properties.

The effect on handle can be controlled. Relevant factors are the gauge of the gauze, the number of strokes, and the quantity of printing paste applied. Both theory and experience suggest that a thin layer on the fabric gives the best fixation and, of course, the best handle.

Sometimes the use of bronze gauze gives trouble because of its electrochemical behaviour and resulting corrosion of its surface. Much better are screens made of polyester filament. They have, furthermore, the advantage of maintaining their tension whether wet or dry. To select a suitable

screen lacquer which is stable to solvents used in manufacturing the printing emulsions causes no difficulty.

8. SPECIAL STYLES

(a) *Flocking*

In spite of the fact that there are many special adhesives for flocking on the market, most of the pigment binders are suitable for binding flocks to the fabric. Instructions for application should be taken from the dye manufacturers' circulars, because the procedure normally differs from case to case. It may become advisable to incorporate pigments into flock binders in order to avoid any contrast between ground colour and flocked design. For this purpose those pigment preparations should be used which do not contain any binding agents.

(b) *Fluorescent and Phosphorescent Dyes*

These dyes can be applied also with pigment binders. It is, however, preferable to have these dyes converted into a pigment form, which can be achieved by dissolving in a resin solution, which is precipitated and milled. For the application of these pigments the same directions apply as detailed under § 2. It should be remembered that the dyes may be affected by the catalysts or auxiliaries, and in such cases the stability of these colour pastes may be lower.

(c) *Pigment White*

The fixation of a pigment white with good covering properties was a problem for a long time, and in the solution of this problem extraordinary obstacles had to be overcome. It was found that, not only is the degree of dispersion of the white pigment of influence on the covering effect, particularly on dark grounds, but also the very fine white pigments must be prevented from penetrating the fabric too far and thus disappearing from the surface. The quantity of white pigment cannot be increased indefinitely. As a general rule, white pigment pastes require at least their own weight of binder. If the maximum quantity of white pigment is exceeded, and on account of this more concentrated binders are used, the handle of the fabric will become too stiff. Smaller quantities of binders, however, give insufficient fixation. The possibility of using softeners in printing with white pigments is very limited because softeners normally are chemically inert. Thus they cannot be fixed, and also prevent the complete cross-linking of the binder. Furthermore, they can give a tacky handle. Another disadvantage is that they decrease the speed of drying. The only possibility of obtaining good covering with a white pigment is application in a micro-coagulated form on the surface of the fabric, ensuring at the same time sufficiently good adhesion to the fibre.

In machine printing another difficulty is that the thickness of the layer is limited by the depth of the engravings. Needless to say, white pigment prints on the machine should be crushed only once in order to get the necessary evenness. If they are crushed again, the covering properties will suffer.

9. SPRAY PRINTS

For the application of pigment pastes with a spray gun, it is only necessary to have the correct viscosity of the spraying liquor, and the appropriate ratio between pigment and binder. Preferably, high quantities of pigments should be used with sufficient binder but without a thickener, and sprayed in a thin layer. In this way the prints are softer and faster than when thin pastes are sprayed in a thick layer.

E— Present Limitations to the Use of Pigments

In order to overcome the obstacles to the use of pigments, the dye manufacturers are endeavouring to develop suitable binding agents, because the limitations of the process are normally due to the characteristics of the binders. The final stage of development has certainly not yet been reached. It can be seen, however, that some limitations exist which are inherent in the system, and in some of these cases it cannot be expected that the obstacles will be overcome. These limiting effects are results of the chemical and physical properties of pigments and binders, and the features of the equipment.

No absolutely insoluble body exists, and for resins it is still more true that no resins exist which are absolutely insoluble in the solvents with which they come into contact during use or cleaning. Resin films are most readily soluble in or swellable by those solvents which are most similar to the resins in chemical constitution. Furthermore, in every case there must be a certain ability to swell in water, in view of the desired soft handle and porosity and flexibility of the film. This effect is increased by the emulsifiers which are necessarily present. In other words, although it might be possible to develop a film with optimum insolubility in aqueous and non-aqueous solvents, this film would not attain the resistance to either of these solvent classes which could be attained by a film designed mainly for insolubility in one solvent class rather than for general insolubility. Since every film will swell to a certain extent, it will be subject to a distinct abrasion during any mechanical treatment in the wet state. However, the resistance to abrasion of many binders on the market nowadays is superior to that of many fibres. It would, therefore, be a mistake to ask for instance for a higher resistance of a resin film to severe mechanical treatment than the fabric itself could resist.

The changes undergone by pigment binders on exposure to light and oxygen are sometimes discussed. For the production of specific styles the products have to be adapted to the requirements of use. However, it would be unreasonable to expect the film to be more stable to light than the fabric itself. This, for instance, is the case with some of the synthetic fibres. Articles which are subjected to prolonged exposure to light, e.g. curtains, will normally be washed very carefully, because otherwise they would shrink and lose their shape. Scrubbing shows up most clearly any alteration in fastness, but nobody would scrub a curtain with a brush. The reasons for the alteration

on exposure to light, and the consequent deterioration in the fastness properties of the binder, are not completely explained by the investigations which have been carried out up to the present. However, it is known that the C:C bond can absorb oxygen in the form of ozone, and then be split as ozonides. It is not surprising, therefore, that the fastness of these films to solvents and dry cleaning suffers.

In discussing the behaviour of resin films printed on naphtholated grounds, it was mentioned that the resins show some adsorption of loose colour from the washing liquor. It is not known whether this adsorption is a purely surface effect, perhaps due to the porosity of the film, or whether in this case the electrical charge plays a part. The latter does not seem to be the case, because the adsorption seems to be independent of the sign and the magnitude of the electrical charge, and all attempts to neutralise it by addition of suitable auxiliaries failed completely.

Some screen printers complain that, when applied in repeated fall-ons and in deep colours, the pigment print pastes dry too slowly, and therefore cause marking-off under the screens. This disadvantage cannot be overcome, and an improvement can be obtained only by a suitable variation in processing, e.g. good ventilation. An alteration in the printing recipe cannot provide the desired improvement, because for fixation of the considerable quantities of pigment in deep colours adequate quantities of binders are necessary. These binders can start to dry only at the surface, and the diffusion of the water inside is slowed down by the high viscosity of the print paste. All attempts to increase the drying speed by selection of low-boiling solvents cause considerable trouble by the formation of skin on the print paste surface, which is normally the reason for the blocking of the screens. Furthermore, low-boiling solvents will start to volatilise in the print paste and cause bubbles. Obviously, there is a direct proportion between drying speed, quantity of liquid medium, and surface area: the lower the surface area becomes, the lower the drying speed will be. In the printing of several colours falling on each other, the surface area remains the same, but the quantity of paste is considerably increased.

In many cases, in the dyeing of fine poplins it is required that the handle of the fabric should not be affected at all. From the dyeing recipes, assuming a fabric pick-up of about 80%, it is apparent that the dyed fabric will increase its weight by several per cent. This, of course, will increase the volume of the dyed fabric, and in order to compensate for this an alteration of the fabric construction is the only possibility. The question of the application of softeners has been thoroughly investigated. Softeners can be divided into three groups—

(1) Those which confer greater smoothness on the surface of the fabric, and compensate for the sometimes rather rough handle, which is caused by the harshness of the film.

(2) Classic softeners, which are chemically completely inert, and have an extremely high boiling range, if any. As already mentioned, they cannot be cross-linked, and will therefore not resist a dry-cleaning process. Used in excess, they will affect even the cross-linking of the binder film itself.

(3) Internal softening is the combination of binders with chemical compounds which have softening substituents, and also reactive groups which can be cross-linked. It gives permanent and fast softening. Although this last group of softeners cannot prevent an increase of weight, they are so effective that only an expert is able to identify a fabric as containing resin-bound pigment.

There is a close connection between the storage life of pigment print pastes and their ease of fixation, or the temperature necessary for fixation. Binders which can be fixed at low temperatures naturally will have a noticeable speed of reaction even at normal temperatures. Their storage life is therefore limited to a few months, or only weeks, but this can be increased by cold storage or dilution. By dilution is meant mixing with printing emulsions, so that the quantity of binder in this emulsion is not higher than is necessary later on in the printing paste. By this means the storage life is increased at least threefold, and sometimes even five- to ten-fold.

Sometimes it is considered a disadvantage that pigment binders which require baking mean a low speed at the baking equipment, because for a temperature of 130°c. a baking time of 3–4 min. is required. It is true that the time of baking can be reduced by increasing the baking temperature, but this cannot be applied to all fabrics, because they might not withstand the higher temperatures. Furthermore, it is difficult to raise the temperature to these higher levels, because a great part of the energy is taken up by the heat capacity of the fabric and in removing the water content of the material. The possibility of tendering must be considered, and even cotton, which is considered a stable fibre, is sometimes tendered at temperatures above 130°c. by acids or acid donors. This is more evident with ammonium nitrate than with ammonium phosphate. Our own investigations on the dependence of tendering on the nature and the concentration of the acid donor, the temperature, and the baking time are not yet complete.

It is not yet quite clear whether it is advisable to use infrared radiators for drying and baking pigmented films. The author's own experience on limited material has shown that, in spite of the increase in heating efficiency to such an extent that the surface of the fabric became burnt, a good cross-linking of the binder film was not obtained. It must be stated, however, that general validity cannot be claimed for this statement.

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GERMANY

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Discussion

MR. J. S. WARD: Will the lecturer give a statement on the limitations of colour, particularly in the case of reds and heavy depths, for pigment

dyeing, having regard to the ultimate fastness properties?

Dr. KASS: In printing there is no limitation to the depth of colour. In piece-dyeing the fastness properties in deep and sometimes even in medium depths are not satisfactory. Overpadding with binders after dyeing gives a stiff handle without the requisite improvement in fastness properties.

Mr. GARRETT: Would the lecturer prefer a mercerised or an unmercerised fabric for the application of pigment printing compositions?

Dr. KASS: We know from experience that the result on mercerised fabrics is better. This is due both to the fact that dirt, fats, and waxes are removed thoroughly from the fabric, and also to the fact that the caustic treatment alters the crystal structure of the fibre molecule. This leads to better wetting and swelling properties. Bleaching generally works in the same way. The degree of whiteness itself plays no part.

Mr. R. L. HILL: In my opinion a full hypochlorite bleach gives better fastness than continuous bleaching by, for example, the chlorite process. The effective factor in this connection is the removal of soluble matter. Does Dr. Kass think that the production of a clean surface of a fabric is important, or is a good "bottoming" thought to be essential, particularly with reference to good keying of the resin composition to the material?

Dr. KASS: A good wettable surface free from soluble products is only one of the requirements. Good bottoming of the material is desirable to obtain good penetration of the binder into the material, because in this case the area reacting with the fibre is larger.

Mr. CLARKE: There are two general systems of pigment printing, viz. oil-in-water and water-in-oil. Could the lecturer state that the oil-in-water type gives greater freedom from abrasion faults and also from screen blocking? Which system does the lecturer prefer?

Dr. KASS: Normally, all processes which work with oil-in-water emulsions show less abrasion. This fact, however, need not be a consequence of the system alone, but depends very much on the quantity of resin, the swelling properties of the film, and also how well the pigment is enclosed in the film. Furthermore, hardness and the character of the surfaces of both pigment and film exert as much influence as the thermoplasticity.

With regard to the clogging of screens, the oil-in-water system is frequently more sensitive, particularly in cases where the resins are not dissolved but emulsified. By suitable precautions, e.g. addition of urea or emulsifier, clogging can be prevented.

For the printing of high-quality styles most printers prefer the oil-in-water system.

Mr. C. P. ATKINSON: The lecturer mentioned a time of baking of 3–4 min. at 130°C. Does he think that the fluidised-bed machine, which gives extremely efficient heat exchange, would be a possibility? Could one, for example, expect efficient fixation in this machine, using a time of a few seconds at 170°C.?

Mr. J. G. A. CORBISHLEY: My experience, using a fluid-bed machine, is that the cotton fabric picks up $\frac{3}{4}$ lb. of sand per lb. of material.

Mr. ATKINSON: Recent experience, substituting glass beads for sand, has virtually overcome the problem of pick-up of material from the fluid-bed machine.

Dr. KASS: It can be expected that the fluidised-bed machine would shorten the time of baking, because the contact between the fabric and the hot sand will certainly give better heat transfer. I do not know whether any production experience is available.

Mr. ATKINSON: Has the lecturer any suggestions for pigment printing compositions on tufted carpets?

Dr. KASS: For the printing of pigments on tufted carpets, very thin print pastes are required, and when using gauze screens special experience and skill are necessary. A safer method of application is to work with stencil and spray-gun, but this means low production rates.

Mr. R. AARON: Would the lecturer amplify his statement that solvents influence scumming?

Dr. KASS: Low-boiling solvents cause quicker drying of the print pastes. The frictional heat at the edge of the doctor increases the undesirable rapidity of drying, which sometimes results in scumming. An addition of printing oils or soluble waxes as a corrective can be avoided by using higher-boiling solvents for the manufacture of the printing emulsion. A boiling range of 250–300°C. is particularly advisable for printing very small designs at high running speeds. The smell of the higher-boiling solvents is in such cases of no importance, because only a small quantity of print paste is applied to the fabric.

Mr. HILL: My experience is that the solvent used to control scumming depends upon the particular pigment printing composition employed.

Dr. KASS: A certain tendency to scumming is inherent in the oil-in-water system. In the opposite system the outer hydrocarbon phase works as a natural lubricant. The nature and the quantity of the resin are, however, of greater importance.

Mr. BURGESS: What is the fastness of pigment printing compositions applied to wool?

Dr. KASS: Certain pigment printing processes do exist which give good fastness properties on wool. As far as I know, this applies only to chlorinated wool.

Mr. H. R. HADFIELD: For the oil-in-water type of pigment printing compositions, are silicone oils of any value for controlling foaming?

Dr. KASS: Several silicone oils show good foam-preventing properties. The foam-destroying efficiency is lower than that of several turpentines and certain alcohols, e.g. the C_8 and C_{10} alcohols. A difficulty exists in the distribution of silicone oils in an aqueous system. It is possible to dissolve them in hydrocarbons and emulsify into the print paste. Unfortunately, the stability of these solutions is limited to 1–2 days. The advantage of silicone oils for the purpose of defoaming is their non-volatility and the resulting permanent efficiency.

Mr. C. W. SEELEY: Has Dr. Kass any statement to make on the fastness of pigment printing compositions to trichloroethylene and perchlorethylene during a dry-cleaning process?

Dr. KASS: In order to confer good stability to dry-cleaning on pigment prints, the pigments themselves should be fast to the corresponding solvents. As mentioned above, satisfactory fastness properties of the resins are also required. To my knowledge, there is only one exception where solvent-soluble pigments resist a dry-cleaning process. This is with lacquer prints using cellulose nitrate, which incorporates the pigments so completely that the solvent cannot penetrate into the film.

Mr. HADFIELD: Are pigment-printed fabrics fast to steam pleating processes? Is there any danger of pigment migrating to the surface of the resin during the steaming stage?

Dr. KASS: The resin film has no smooth, continuous surface. Therefore some pigment particles are always sticking out of the film surface, and the possibility of partial sublimation is always present. Most pigments which are used for textile printing, however, do not show any sublimation. True migration will not take place.

Mr. HOCKING: What is the percentage of resin usually found on resin-printed fabrics?

Dr. KASS: Assuming an average depth of engraving and a 100% coverage of the design, a colour consumption of about 700 g./sq.metre can be considered as normal. The solids content in the print paste varies between 5 and 20%. Therefore the increase in weight will vary between 35 and 140 g./sq.metre.

Mr. HOCKING: Does this resin in any way affect subsequent pleating processes?

Dr. KASS: It depends on the properties of the resin whether any influence during pleating will be observed. Normally there are no difficulties. The resin must not, however, be too thermoplastic.

Mr. HILL: What proportion of resin is actually used to fix the pigment when it is applied to an absorbent substrate?

Dr. KASS: The proportion of pigment to resin is governed by the fastness properties required. It varies between the limits 1 : 1 and 1 : 4 (each solid).

Mr. HILL: Is some of the resin actually absorbed into the fibre, where it can take part in keying the pigment to the material?

Dr. KASS: The resin should penetrate the microstructure of the fabric as far as possible. In many cases, however, this complete penetration will not be obtained.

Mr. CALDWELL: Do the functional groups in the resin react with the fibre and/or the pigments? Is good fastness possible without cross-linking of the resin with the fibre or the pigment?

Dr. KASS: The functional groups of the resin certainly do not react with the pigment, but nearly always with the functional groups of both resin and fibre. Good fixation without cross-linking agents is in some cases possible, depending on the type of fibre. In these cases, electrical or mechanical attractions become effective.

Mr. MITCHELL: Could the lecturer give a mechanical picture of the distribution of pigment and resin during the stages of pigment printing?

Dr. KASS: The pigment normally is dispersed in the external phase. It depends on the type of resin whether the pigments are dissolved or emulsified in one of the phases, mostly in the external one. They are very seldom in both phases; if they are, they consist of chemically different components. During the drying the two phases become separated, and the cross-linking starts.

Mr. MITCHELL: What is the function of the emulsifier?

Dr. KASS: The presence of emulsifiers gives better stability to the pigment dispersion, improves the homogenisation of binders and thickeners, increases the compatibility with several additions necessary to the print paste, and very often improves the running properties on the roller machine.

Mr. MITCHELL: If the pigment is completely enclosed by the binder, one would expect that different binders would give different fastness values with the same pigment. My experience is that this is not the case. A bad pigment is always a bad pigment. Would the lecturer like to comment?

Dr. KASS: The cross-linked film is flexible and porous. It does not cover all pigment particles completely. This fact becomes particularly obvious in the case of solvent-soluble pigments: they disappear rapidly from the film when treated with solvents. As an exception, I have already mentioned the cellulose nitrate lacquers, which are homogeneous but very stiff.

Mr. BURGESS: What methods are available for stripping pigment printing compositions from fabrics?

Dr. KASS: No reliable method of stripping without damage to the fabric and without disadvantage in redyeing or reprinting is known to me. Sometimes pigment-piece-dyed fabric can be stripped. The method must be adapted to the chemical character of the pigment.

Mr. H. A. TURNER: Is there any suggestion that a simple precondensate which has a wide molecular-weight distribution gives better fixation of the pigment than a precondensate with a narrow molecular-weight distribution?

Dr. KASS: In our experience such general rules cannot be established. It is possible, however, to determine certain molecular-weight ranges of the precondensate, which give maximum fixation. This is done empirically, and the figures differ individually. In all cases that I know of, a wider molecular-weight distribution gives less fixation.

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THE SOCIETY'S FASTNESS TESTS CO-ORDINATING
COMMITTEE—XXIII

Standard Methods for the Assessment of the Colour Fastness of Textiles

(Third Report of the Fastness Tests Co-ordinating Committee)

First Supplement

Foreword

The *Third Report of the Fastness Tests Co-ordinating Committee*, which was published in June 1955, gave details of a large number of tests for the determination of the colour fastness of textiles (J.S.D.C., **71**, 283, 464 (1955)). This report was subsequently issued separately by the Society under the title *Standard Methods for the Assessment of the Colour Fastness of Textiles*[2], and the tests were also issued with editorial changes as *British Standards* 2661–2686 : 1956.

As stated in the Foreword to the Third Report, most of the tests then published were identical with tests being developed on a world basis by the International Organisation for Standardisation (ISO). The stages through which such tests pass before they are finally accepted can be classified as follows—

1. Test under discussion
2. Tentative test
3. Proposed ISO Recommendation
4. ISO Recommendation.

A further meeting of the ISO Colour Fastness Subcommittee (ISO/TC 38/SC 1) was held in New York in September 1956. At this meeting modifications were introduced to some of the tests which were in categories 1 and 2 above, and minor changes were incorporated in some of the tests which had reached the Proposed ISO Recommendation state. Progress was also made in raising the status of some of the tests.

Several other tests were discussed for the first time, viz. (*a*) Colour Fastness to Cold Vulcanising and Colour Fastness to Hot-air and Hot-steam Vulcanising, which became ISO Tentative Tests, and (*b*) Colour Fastness to Formaldehyde, which remains under consideration.

The present publication details these changes and additions, and is intended to be used in conjunction with the Third Report or its equivalent, *Standard Methods for the Assessment of the Colour Fastness of Textiles.*

It should be noted that the term *ISO Recommendation* is applied to a test on which agreement has been reached on a world basis. The word "recommended" is used by ISO, since that body has no legal authority to impose its decisions on the national standardising bodies which form its membership. Although, therefore, ISO can only recommend acceptance, in practice most member countries regard this as definite and take steps to establish such tests as national standards. The British Standards Institution has already done this for the United Kingdom.

To facilitate reference, the tests in this supplement are set out as far as possible in the same style as in the original report. Page numbers on which tests begin are given for both the Third Report and "Standard Methods". Amended wording is printed in roman type, and comments and instructions for corrections *in italic.*

Colour Fastness of Textiles: General Principles of Testing

(Pp. 285, 5)

Subject to the following amendments, this document, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

7. Specimen

§ 7.7 should read—

7.7 **Fibres**— Loose fibres may be tested by combing and compressing into a flat pad, which may then be sewn between the undyed cloths. The amount of material taken for test should equal approximately one-half of the combined weights of the staining cloths.

7.8 **Undyed Cloth for Staining—**

§ 7.8.2 should be altered to 7.8.3, *and a new clause inserted—*

7.8.2 The first cloth should be of the same fibre as the cloth under test or, where blends are being tested, of the predominant fibre in the cloth under test. The second cloth should be as indicated in the individual tests or as otherwise specified, or multifibre test cloth: where multifibre test cloth is used for the purpose, the fact should be recorded in the test report. Where blends are being tested, the second undyed cloth should be of the same fibre as the second in order of predominance in the blend under test.

10. Fastness of Dyes

A new paragraph should be inserted following the first paragraph—

In the case of navy blues and blacks two standard depths are illustrated. Wherever possible, dye manufacturers' pattern cards should provide fastness data for both depths.

11. Assessment of Colour Fastness

11.3 **Colour Fastness with respect to Staining—**

The last sentence should read—

The staining is assessed for each type of undyed material in the test, staining at the stitching being ignored.

Colour Fastness: Grey Scale for assessing Change in Colour

(Pp. 289, 9)

Colour Fastness: Grey Scale for assessing Staining

(Pp. 291, 11)

These tests, which were previously Proposed ISO Recommendations, now become part of ISO Recommendation R 117.

Colour Fastness to Acid Spotting

(Pp. 292, 13)

Subject to the following amendment, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

§ 3.6 should read—

3.6 . . . 100 g. crystalline tartaric acid . . .

Colour Fastness to Alkali Spotting

(Pp. 293, 14)

This test, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

Colour Fastness to Bleaching with Hypochlorite

(Pp. 293, 15)

Subject to the following amendments, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

§ 3.2 should read—

3.2 Hydrogen peroxide solution containing 2·5 ml. of 30% (wt./vol.) hydrogen peroxide per litre or a solution containing 5 g. of sodium bisulphite ($NaHSO_3$) per litre. The weight of the solution used should be 50 times the weight of the specimen.

§§ 3.3 and 3.4 should be altered to 3.4 *and* 3.5 *respectively, and a new clause inserted—*

3.3 0·5% neutral soap solution at 75–85°F. (25–30°C.) for wetting out water-repellent fabrics.

5. Procedure

This should be—

5.1 If the textile to be tested has a water-repellent finish, wet out the specimen thoroughly in the soap solution (see § 3.3). Drain the specimen of excess liquor so that it retains approximately its dry weight of wetting-out solution, and immediately place the specimen in an open or loosely rolled form in the sodium hypochlorite solution (see § 3.1).

5.2 If the textile to be tested has no water-repellent finish, wet out the specimen in distilled water, remove the excess water, and place the specimen in an open or loosely rolled form in the sodium hypochlorite solution (see § 3.1).

5.3 Close the container and keep the specimen in the solution at 20 ± 2°C. (68 ± 4°F.) for 60 min. Avoid exposure to direct sunlight.

5.4 Rinse the specimen thoroughly in cold running tap-water, immerse it in one of the solutions specified in § 3.2 at room temperature, and agitate it with a glass rod for 10 min.

5.5 Rinse the specimen thoroughly in cold running tap-water, remove the excess water, and dry the specimen in air at a maximum temperature of 60°C. (140°F.).

5.6 Assess the change in colour of the specimen with the grey scale (see § 7.1).

Colour Fastness to Bleaching with Peroxide

(Pp. 294, 464, 16)

This test, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

In Table I footnote (a) *should read—*

(a) 30% H_2O_2 (wt./vol.)

and an additional footnote (h) *should be inserted—*

(h) Bath 2 is included primarily to meet the requirements of some Continental countries.

Colour Fastness to Carbonising with Aluminium Chloride

(Pp. 296, 464, 18)

Colour Fastness to Carbonising with Sulphuric Acid

(Pp. 297, 464, 20)

These tests, which were previously Proposed ISO Recommendations, now become part of ISO Recommendation R 117.

Colour Fastness to Chlorination, Acid

(Pp. 298, 465, 22)

Subject to the following amendments, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

§ 3.5 should read—

3.5 **Test Control**— A dyeing of 1% Solway Blue GS (C.I. Acid Blue 37) on wool cloth (see § 7.1).

7. Notes

§ 7.1 should read—

7.1 **Test Control**— . . . a dyebath containing 1% Solway Blue GS, . . .

Colour Fastness to Light: Daylight

(Pp. 300, 24)

Subject to the following amendments, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Standards and Equipment

§ 3.2 should read—

3.2 **Exposure rack,** facing due south in the Northern Hemisphere, north in the Southern Hemisphere, and sloping at an angle from the horizontal approximately equal to the latitude of the place where the exposure is made. The rack should be placed so that shadows of

surrounding objects will not fall on the exposed textiles, and covered with window glass to protect the specimens from the weather, the glass being not less than 5 cm. from the specimens and provided with adequate ventilation.

5. Procedure

§ 5.1 should read—

5.1 . . . simultaneously to daylight for 24 hr. per day under the conditions . . .

7. Notes

7.5.1.5 **Assessment of Light Fastness—**

Add the following—

If two different assessments are obtained at the two different degrees of contrast, the light fastness of the specimen is the arithmetic mean of these two assessments.

Colour Fastness to Mercerising

(Pp. 304, 28)

Colour Fastness to Metals in the Dyebath: Chromium Salts

(Pp. 305, 30)

Colour Fastness to Metals in the Dyebath: Iron and Copper

(Pp. 306, 31)

Colour Fastness to Organic Solvents

(Pp. 306, 32)

Colour Fastness to Potting

(Pp. 307, 465, 34)

The above tests, which were previously Proposed ISO Recommendations, now become part of ISO Recommendation R 117.

Colour Fastness to Pressing: Hot Pressing

(Pp. 308, 35)

Subject to the following amendment, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

4. Specimen

§ 4.2 should read—

4.2 . . . wind it round a piece of thin inert material 14 cm. × 4 cm. . . .

Colour Fastness to Rubbing

(Pp. 310, 37)

This test, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

In addition to the Crockmeter, two other instruments are under discussion by ISO—

(1) The instrument designed by P. Krais and described in *Monatsschrift für die gesamte Textilindustrie*, No. 48, 105 (1933) and in *Textil-Forschung*, No. 15, 33–34 (1933). It is obtainable from Hugo Kevl, Dresden N 6, Grossenhainerstrasse 29, Germany. If this instrument is employed, care should be taken to see that it is adjusted to the same pressure (g./sq.cm.) and size as the Crockmeter.

(2) The instrument described by F. Ruf in *Textil-Praxis*, **9**, 1165 (1954); *Melliand Textilber.*, **36**, 755 (1955). It is obtainable from Schröder KG., Weinheim/Bergstrasse, Bahnhofstrasse 16, Germany.

Colour Fastness to Soda Boiling

(Pp. 311, 38)

This test, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

Colour Fastness to Stoving

(Pp. 312, 465, 40)

This test, which was previously a Proposed ISO Recommendation, has been amended as follows, and now becomes part of ISO Recommendation R 117.

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles of all kinds and in all forms to the action of sulphur dioxide as used for bleaching animal fibres.

2. Principle

2.1 A specimen of the textile containing its own weight of soap solution and a control are exposed in an atmosphere containing sulphur dioxide. The change in colour of the specimen and the staining of the undyed cloths are assessed with standard grey scales.

3. Apparatus and Reagent

3.1 Vessel of approx. 10 litres capacity for the sulphur dioxide atmosphere

3.2 Sulphur

3.3 Soap, containing not more than 5% moisture and complying with the following requirements based upon dry weight—

Free alkali calculated as Na_2CO_3	0·3% maximum
Free alkali calculated as NaOH	0·1% maximum
Total fatty matter	85% minimum
Titre of mixed fatty acids prepared from the soap	30°C. maximum
Iodine value	50 maximum

3.4 Soap solution, containing 5 g. of soap (see § 3.3) per litre in distilled water

3.5 **Test Control**— A dyeing on wool of 2.5% Supranol Fast Red BR extra (C.I. Acid Red 163) (see § 7.1)

3.6 Two undyed cloths, each 10 cm. × 4 cm., one piece made of wool and the other of the same fibre as the cloth under test

3.7 Grey Scales for assessing Change in Colour and Staining (see § 7.2).

4. Specimen

4.1 If the textile to be tested is fabric, place a specimen of it 10 cm. × 4 cm. between two pieces of undyed cloth required in § 3.6 and sew along all four sides to form a composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric and treat it as in § 4.1, or form a layer of parallel lengths of it between the two undyed cloths and sew around the four sides to hold the yarns in place.

4.3 If the textile to be tested is loose fibre, comb and compress enough of it to form a sheet 10 cm. × 4 cm. Place it between two undyed cloths, and sew around the four sides to hold the fibres in place.

4.4 **Test Control**— Prepare a composite specimen of the test-control dyeing (see § 3.5) in the way outlined for fabric in § 4.1.

5. Procedure

5.1 Thoroughly impregnate the composite specimen and the composite test-control specimen by immersion for 5 min. at 25 ± 2°C. (77 ± 4°F.) in the soap solution, and then squeeze so that each contains its own weight of solution.

5.2 Suspend the composite specimen and the composite test-control specimen for 16 hr. in the vessel containing an atmosphere of sulphur dioxide obtained by igniting 5 g. of sulphur below the composite specimen and the control and immediately closing the vessel.

5.3 Remove the composite specimen and the composite control from the sulphur dioxide atmosphere, remove the stitching along three sides of each, and allow both to hang in air for at least 2 hr. without rinsing. The composite specimen and the composite test-control specimen are to be examined when dry. If the composite specimen contains cellulosic fibres, rinse it immediately after removal from the sulphur dioxide atmosphere in distilled water, then in cold running tap-water. Remove the stitching along three sides of both specimens and dry them in air at a temperature not exceeding 60°C. (140°F.).

5.4 Assess the effect on the test-control specimen with the grey scale. If the change in colour is not equal to the contrast illustrated by Grade 3, the test has not been carried out correctly, and the operations described in §§ 5.1–5.5 inclusive must be repeated with a fresh composite specimen and a fresh composite test-control specimen.

5.5 Assess the change in colour of the specimen and the staining of the undyed cloths with the grey scales (see § 7.2).

6. Report

6.1 Report the numerical ratings for the change in colour of the test specimen and for the staining of each kind of undyed fibre tested.

7. Notes

7.1 **Test Control**— A well wetted-out pattern of wool cloth is entered at 40°C. (104°F.) into a dyebath containing 2·5% Supranol Fast Red BR extra (C.I. Acid Red 163), 10% sodium sulphate crystals ($Na_2SO_4,10H_2O$), and 3% acetic acid (30%), percentages being calculated on the weight of the pattern. The liquor ratio is 40 : 1. The dyebath is raised to the boil in 30 min. and boiled for 30 min. If necessary, the dyebath is exhausted by careful addition of 1–3% acetic acid (30%) or 1% sulphuric acid (sp.gr. 1·84) well diluted with water. The bath is boiled for a further 15 min. after addition of the acid. The pattern is then removed, rinsed in cold running tap-water, and dried.

7.2 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness: Grey Scale for assessing Change in Colour.*

Colour Fastness to Washing: Hand Washing

(Pp. 313, 42)

Subject to the following amendment, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

In § 3.2 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter 85% minimum

Colour Fastness to Water

(Pp. 315, 44)

Subject to the following amendments, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

§ 3.2 should read—

3.2 Two undyed cloths, each 6.0 cm. × 6.0 cm., . . .

4. Specimen

§ 4.1 should read—

4.1 . . . a specimen of it 6.0 cm. × 6.0 cm. . . .

§ 4.3 should read—

4.3 . . . a sheet 6·0 cm. × 6·0 cm. . . .

5. Procedure

§ 5.1 should read—

5.1 . . . glass plates measuring about 7.5 cm. × 6.0 cm. (11.5 cm. × 6.0 cm. if the Perspirometer is used) under a force . . .

7. Notes

§ 7.1 should read—

7.1 5.1 . . . (area of bottom greater than 6·0 cm. × 6·0 cm.)

Colour Fastness to Sea Water

(Pp. 316, 46)

Subject to the following amendments, this test, which was previously a Proposed ISO Recommendation, becomes part of ISO Recommendation R 117.

3. Apparatus and Reagents

§ 3.2 should read—

3.2 Two undyed cloths, each 6.0 cm. × 6.0 cm., . . .

4. Specimen

§ 4.1 should read—

4.1 . . . specimens of it 6.0 cm. × 6.0 cm. . . .

§ 4.3 should read—

4.3 . . . a sheet 6·0 cm. × 6·0 cm. . . .

7. Notes

§ 7.1 should read—

7.1 5.1 . . . (area of bottom greater than 6·0 cm. × 6·0 cm.)

Colour Fastness to Water Spotting

(Pp. 317, 48)

This test, which was previously a Proposed ISO Recommendation, now becomes part of ISO Recommendation R 117.

Colour Fastness to Alkaline Milling

(Pp. 318, 465, 49)

Subject to the following amendments, this test, which was previously an ISO Tentative Test, becomes a Proposed ISO Recommendation.

3. Apparatus and Reagents

§ 3.2 should read—

3.2 Balls, 0·6 cm. in diameter, made of 18–8 stainless steel.

In § 3.4 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter	85% minimum

4. Specimen

This should read—

4.1 If the textile to be tested is cloth, a specimen 16 cm. × 8 cm. is required. Cover one side (the face) of the specimen with the undyed cloths (see § 3.3), and sew them in place along their four edges. In addition, sew in one direction only at intervals of approx. 1 cm. Weigh this composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric and treat as in § 4.1.

4.3 If the textile to be tested is loose fibre, comb and compress an amount at least equal in weight to the undyed wool cloth. Lay the loose fibre evenly between the two undyed cloths, and sew the layers together by stitching in one direction at intervals of approx. 1 cm. Weigh the specimen.

4.4 Prepare a composite test-control specimen from the test control (§ 3.5) in the way in which the composite specimen was prepared (§ 4.1).

5. Procedure

This should read—

5.1 Carry out the operations described in §§ 5.2–5.6 inclusive with the composite specimen and the composite test-control specimen in parallel in separate baths.

5.2 Put the composite specimen and the composite test-control specimen in separate containers in the machine (see § 7.1), each with three times its own weight of the milling solution (see § 3.4) and 50 of the stainless-steel balls. Run the machine at 40°C. (104°F.) for 2 hr.

5.3 Add sufficient water at 40°C. (104°F.) to give a liquor ratio of 100 : 1, and run the machine for an additional 10 min.

5.4 Remove the composite specimens, rinse in cold running tap-water for 10 min., separate the specimens from the undyed cloths, and dry them at a temperature not exceeding 60°C. (140°F.).

5.5 Assess the change in colour of the test control and the staining of undyed cloth with the appropriate grey scales. If the change in colour and the staining are not equal to 3 on the appropriate grey scales, the test has not been carried out correctly, and the operations described in §§ 5.1–5.6 must be repeated with a fresh composite specimen and a fresh composite test-control specimen.

5.6 Assess the change in colour of the specimen and the staining of the undyed cloths with the grey scales (see § 7.3).

Colour Fastness to Acid Felting: Mild

(Pp. 320, 51)

Subject to the following amendments, this test, which was previously an ISO Tentative Test, becomes a Proposed ISO Recommendation.

3. Apparatus and Reagents

§ 3.2 should read—

3.2 Sulphuric acid solution containing 1 ml. of concentrated sulphuric acid (sp.gr. 1.84) per litre of solution.

Colour Fastness to Acid Felting: Severe

(Pp. 321, 465, 52)

Subject to the following amendments, this test, which was previously an ISO Tentative Test, becomes a Proposed ISO Recommendation.

3. Apparatus and Reagents

§ 3.3 should be renumbered 3.4, *and a new clause inserted—*

3.3 Two rectangular pieces of cloth (10 cm. × 4 cm.), one of which is of wool and the other of another fibre on which it is wished to assess staining. These should be of plain weave, undyed, unsized, and weighing about 125 g./sq.metre (3.7 oz./sq.yd.).

4. Specimen

This should read—

4.1 If the textile to be tested is cloth, place a specimen of it 10 cm. × 4 cm. between the two pieces of undyed cloth (see § 3.3), and stitch through the three thicknesses along all four sides to form a composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric or form a layer of parallel lengths of it, and prepare a composite specimen as in § 4.1.

4.3 If the textile to be tested is loose fibre, comb and compress an amount at least equal in weight to the undyed wool cloth so as to obtain a layer 10 cm. × 4 cm. in size. Prepare a composite specimen of it as in § 4.1.

5. Procedure

This should read—

5.1 Test the composite specimen in accordance with §§ 5.2–5.4 inclusive with sulphuric acid (see § 3.1) and acetic acid (see § 3.2), as separate tests or with only one of these reagents as required.

5.2 Bring the test solution to 90 ± 2°C. (194 ± 4°F.). Immerse the specimen in the solution for 30 min., maintaining this temperature. The liquor ratio is 40 : 1.

5.3 Remove the composite specimen, rinse in cold running tap-water for 10 min., separate the specimens, and dry at a temperature not exceeding 60°C. (140°F.).

5.4 Assess the change in colour of the specimen and the staining of undyed cloths with the grey scales (see § 7.1).

Colour Fastness to Cross Dyeing: Wool

(Pp. 321, 53)

At the 1956 ISO meeting, a number of changes were made in this group of tests, but some of them were subsequently found by the Fastness Tests Co-ordinating Committee to be unacceptable. The tests given in the Third Report, therefore, remain in use, subject to the following amendments—

4. Specimen

§ § 4.2 and 4.3 should read—

4.2 If the textile to be tested is yarn, knit it into fabric or form a layer of parallel lengths of it, and prepare a composite specimen as in § 4.1.

4.3 If the textile to be tested is loose fibre, comb and compress an amount at least equal in weight to one piece of the undyed cloth (see § 3.6) so as to obtain a layer 10 cm. × 4 cm. Prepare a composite specimen of it as in § 4.1.

Colour Fastness to Decatising

(Pp. 323, 55)

Subject to the following amendments, this test, which was previously an ISO Tentative Test, becomes a Proposed ISO Recommendation.

3. Apparatus and Reagents

This should read—

3.1 Suitable decatising apparatus (see § 7.1)

3.2 Cotton blanket cloth napped on both sides weighing about 400 g./sq.metre (12 oz./sq.yd.).

3.3 **Test Control**— A 1% dyeing of Diamond Brown RH Extra (C.I. Mordant Brown 33) (see § 7.2)

3.4 Grey Scale for assessing Change in Colour (see § 7.3).

5. Procedure

§ 5.2 should read—

5.2 Wrap a length of the cotton blanket cloth three times around the perforated cylinder of the decatising apparatus (see § 7.1). Place the specimen and the test-control specimen around the wrapped cylinder, and cover with three further wrappings of the blanket cloth.

§ 5.3 should read—

5.3 Saturated but water-free steam is then passed . . .

§ 5.5 should read—

Mild Decatising	Severe Decatising
4Y	3Y

7. Notes

§ 7.2 should read—

7.2 **Test-control Specimen**— A well wetted-out pattern of wool cloth is entered at 40°C. (104°F.) into a dyebath containing 1% Diamond Brown RH extra (C.I. Mordant Brown 33), 10% sodium sulphate crystals ($Na_2SO_4,10H_2O$), and 3–5% acetic acid (30%), percentages being calculated on the weight of the pattern, at a liquor ratio of 40 : 1.

The dyebath is raised to the boil during 30 min., and boiled for a further 30 min. If necessary, it is exhausted by careful addition of 3–5% acetic acid (30%), and boiled for a further 15 min. after addition of the acid. The dyebath is cooled by addition of cold water, and 0·5% potassium dichromate dissolved in water is added. Then it is raised to the boil and boiled for 45 min.

Colour Fastness to Chlorinated Water

(Pp. 324, 57)

This test has been replaced by the following, which remains an ISO Tentative Test.

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles of all kinds and in all forms to the action of reactive chlorine in concentrations such as are used to disinfect bathing water (break-point chlorination).

2. Principle

2.1 A specimen of the material to be tested is treated with a very weak chlorine solution, rinsed, and dried. The change in colour is assessed with the standard grey scale.

3. Apparatus and Reagents

3.1 Glass container or glazed china container which can be closed

3.2 Solution of sodium hypochlorite containing 20 mg. of reactive chlorine per litre of distilled water at pH 8·5

3.3 Sodium hypochlorite of the following composition shall be used—

Sodium hypochlorite	$NaOCl$	14–16%
Sodium chloride	$NaCl$	12–17%
Sodium hydroxide	$NaOH$	2·0% maximum
Sodium carbonate	Na_2CO_3	2·0% maximum
Iron	Fe	0·001% maximum

3.4 Grey Scale for assessing Change in Colour (see § 7.1).

4. Specimen

4.1 If the textile to be tested is fabric, use a specimen 10 cm. × 4 cm.

4.2 If the textile to be tested is yarn, knit it into fabric and use a specimen 10 cm. × 4 cm., or make a wick of parallel lengths 10 cm. long and about 0·5 cm. in diameter tied near both ends.

4.3 If the textile to be tested is loose fibre, comb and compress enough of it to form a sheet measuring 10 cm. × 4 cm., and sew it on to a piece of desized cotton cloth to support the fibres.

5. Procedure

5.1 Moisten the specimen in distilled water, squeeze, and immerse it, in the open state or loosely rolled, in the sodium hypochlorite solution (see § 3.2) at a liquor ratio of 100 : 1. Close the container, and allow to stand at room temperature for 4 hr.

5.2 Remove the specimen, rinse thoroughly in cold running tap-water, squeeze, and dry in air at room temperature.

5.3 Assess the change in colour with the grey scale (see § 7.1 (*b*)).

6. Report

6.1 Report the numerical rating for the change in colour.

7. Notes

7.1 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness of Textiles: Grey Scale for assessing Change in Colour.*

7.2 A solution containing 20 mg. of reactive chlorine per litre at pH 8·5 may be obtained as follows—

7.2.1 A sodium hypochlorite solution (13·3 ml.) containing 150 g. of reactive chlorine per litre (see § 3.2) is diluted with distilled water to 1000 ml. to give a solution containing 2 g. of reactive chlorine per litre.

7.2.2 This solution (10 ml.) is added to 1000 ml. of a solution buffered according to Clark and Lubs at pH 8·5 (5·1 ml. of 0·1 M. sodium hydroxide, 0·0144 g. of potassium chloride, and 0·1123 g. of boric acid per litre).

The concentration of the solution is to be checked by titration with thiosulphate, and the pH value determined electrometrically.

Colour Fastness to Degumming

(Pp. 326, 59)

This has been replaced by the following test, which becomes a Proposed ISO Recommendation.

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles of all kinds to the action of soap solutions such as are used in degumming raw silk.

2. Principle

2.1 A specimen of the textile in contact with undyed cloth is treated with a soap solution, rinsed, and dried. The change in colour of the specimen and the staining of the undyed cloth are assessed with standard grey scales.

3. Apparatus and Reagents

3.1 A 500-ml. vessel with appropriate reflux condenser

3.2 Soap, containing not more than 5% moisture and complying with the following requirements based upon dry weight*—

Free alkali calculated as Na_2CO_3	0·3%	maximum
Free alkali calculated as NaOH	0·1%	maximum
Total fatty matter	85%	minimum
Titre of mixed fatty acids prepared from soap	30°C.	maximum
Iodine value	50	maximum

* Soap complying with *B.S.* 1912 : 1953 is suitable for use in this test

3.3 Soap solution containing 7 g. of soap (see § 3.2) per litre in distilled water

3.4 Anhydrous sodium carbonate

3.5 Two undyed cloths, each 10 cm. × 4 cm., one composed of raw silk, the other of the same kind of fibre as that in the textile to be tested

3.6 Grey Scales for assessing Change in Colour and Staining (see § 7.1).

4. Specimen

4.1 If the textile to be tested is fabric, place a specimen of it, 10 cm. × 4 cm., between the two pieces of undyed cloth (see § 3.5), and stitch through the three thicknesses along four sides to form a composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric and treat it as in § 4.1, or form a layer of parallel lengths of it between the two undyed cloths and prepare a composite specimen as in § 4.1.

5. Procedure

5.1 Treat the composite specimen in a gently boiling soap solution (see § 3.3) in the 500-ml. vessel (see § 3.1) under reflux for 10 min. The liquor ratio is 100 : 1.

5.2 After 10 min. add anhydrous sodium carbonate at the rate of 0·5 g. for each litre of the boiling soap solution and keep boiling gently for 110 min. (total time 2 hr.).

5.3 Remove the composite specimen from the soap solution, rinse twice in cold distilled water, and then in cold running tap-water for 10 min. Squeeze it thoroughly, remove the stitching along three sides, and dry at a temperature not exceeding 60°C. (140°F.) with the three parts in contact along the one row of stitching only.

5.4 Assess the change in colour of the specimen and the staining of the undyed cloths with the grey scales (see § 7.1).

6. Report

6.1 Report the numerical rating for the change in colour of the specimen and for the staining of the undyed cloth.

7. Notes

7.1 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness: Grey Scale for assessing Change in Colour*

(*c*) *Colour Fastness: Grey Scale for assessing Staining.*

Colour Fastness to Steaming

(Pp. 327, 60)

This test has been replaced by the following, which remains an ISO Tentative Test.

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles of all kinds to the action of the steaming process employed in textile printing. It is mainly applicable to the hydrophobic fibres such as cellulose acetates, polyamides, polyesters, etc.

2. Principle

2.1 A specimen of the textile in contact with specified undyed cloths is placed over the mouth of a flask of water, and a specified volume of water is boiled away in a specified time, the steam passing through the composite specimen. The staining of the undyed cloths is assessed with a standard grey scale.

3. Apparatus and Reagents

3.1 A 500-ml. short-necked flask, the internal diameter of the neck being $2{\cdot}8 \pm 0{\cdot}3$ cm.

3.2 Undyed, bleached cotton cloth

3.3 Undyed cloth of the same material as the specimen

3.4 Grey Scale for assessing Staining (see § 7.1).

4. Specimen

4.1 A specimen 7.5 cm. $\times$ 7.5 cm. of the textile to be tested is placed face downwards, and covered with a piece of undyed, bleached cotton cloth of the same size. A piece of undyed cloth of the same material as the specimen, also 7.5 cm. $\times$ 7.5 cm., is then placed on top of the cotton to form a composite specimen.

5. Procedure

5.1 Place 150 ml. of water in the flask, add a few pieces of porous pot, and heat the contents of the flask to 90 ± 5°C. (194 ± 10°F.).

5.2 Place the composite specimen over the mouth of the flask with the undyed materials uppermost, and secure in position with a rubber band or spring clip placed round the neck.

5.3 Heat the water in the flask to boiling, and adjust the rate so that the whole amount is boiled away in 30 ± 5 min.

5.4 Remove the composite specimen from the flask. Separate the components, and dry in air at a temperature not exceeding 60°C. (140°F.).

5.5 Assess the staining of the undyed cloths with the grey scales (see § 7.1), ignoring the periphery, where condensation may cause excessive local staining.

6. Report

6.1 Report the numerical rating for the staining of the undyed material and the staining of the cotton.

7. Note

7.1 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness: Grey Scale for assessing Staining.*

Colour Fastness to Sublimation

(Pp. 327, 61)

This test is now called Colour Fastness to Sublimation in Storage, *and remains an ISO Tentative Test.*

Colour Fastness to Bleaching with Sodium Chlorite

(Pp. 328, 465, 62)

The two parts of this test have been separated into—

(*i*) *Bleaching with Sodium Chlorite: Mild*

(*ii*) *Bleaching with Sodium Chlorite: Severe*

Both tests are now Proposed ISO Recommendations.

Colour Fastness to Bleaching with Sodium Chlorite: Mild

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of textiles composed of natural and regenerated cellulose, nylon, and other synthetic fibres to the action of mild bleaching with sodium chlorite as employed in textile processing.

2. Principle

2.1 A specimen of the textile in contact with specified undyed cloths is treated in a sodium chlorite solution, rinsed, and dried. The change in colour of the specimen and the staining of the undyed cloth are assessed with standard grey scales.

3. Apparatus and Reagents

3.1 A solution containing 1 g. of sodium chlorite (80%) per litre, with the addition of acetic acid to bring the pH of the solution to 3·5

3.2 Undyed cloths, each 10 cm. × 4 cm., and each composed of the fibre to be assessed for staining

3.3 Test control, if desired (see § 7.3).

4. Specimen

4.1 If the textile to be tested is fabric, place a specimen of it, 10 cm. × 4 cm., on a piece of the undyed cloth (see § 3.2), and sew along all four sides to form a composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric and treat as in § 4.1, or form a layer of parallel lengths of it between two pieces of the undyed cloth and sew around the four sides to hold the yarn in place.

4.3 If the textile to be tested is loose fibre, comb and compress an amount at least equal in weight to one piece of the undyed cloth so as to obtain a layer 10 cm. × 4 cm. Place the layer between two pieces of the undyed cloth, and sew along the four sides to hold the fibres in place.

5. Procedure

5.1 Wet out the composite specimen in the sodium chlorite (see § 3.1) and immerse it in the solution without agitation at a temperature of 80 ± 2°c. (176 ± 4°f.) for 1 hr. The liquor ratio is 50 : 1.

5.2 Rinse the composite specimen in cold running tap-water for 10 min. Remove the stitching from the two long sides and one short side. Open out the composite specimen, and dry it at a temperature not exceeding 60°c. (140°f.) with the three parts in contact at the remaining line of stitching only.

5.3 Assess the change in colour of the specimen and the staining of the undyed cloths with the grey scales (see § 7.1).

6. Report

6.1 Report the numerical rating for change in colour of the specimen and for staining of the undyed cloth or cloths.

7. Notes

7.1 See the following sections—

(*a*) *Colour Fastness of Textiles: General Principles of Testing*

(*b*) *Colour Fastness of Textiles: Grey Scale for assessing Change in Colour*

(*c*) *Colour Fastness of Textiles: Grey Scale for assessing Staining.*

7.2 The concentration of sodium chlorite employed is determined by titration with sodium thiosulphate—

1 ml. of 0·1 M. thiosulphate solution = 0·00226 g. $NaClO_2$

7.3 Unbleached cleaned cotton cloths may be used as test-control specimens. The degree of whiteness shown after the bleaching process indicates the effect of the test.

Colour Fastness to Bleaching with Sodium Chlorite: Severe

1. Purpose and Scope

1.1 This method is intended for assessing the resistance of the colour of natural cellulose textiles to the action of severe bleaching with sodium chlorite as employed in textile processing.

2. Principle

2.1 A specimen of the textile in contact with specified undyed cloths is treated in a sodium chlorite solution, rinsed, and dried. The change in colour of the specimen and the staining of the undyed cloths are assessed with standard grey scales.

3. Apparatus and Reagents

3.1 A solution containing 2·5 g. of sodium chlorite (80%) per litre and 0·1 g. of tetrasodium pyrophosphate ($Na_4P_2O_7,10H_2O$) per litre with the addition of formic acid to bring the pH of the solution to 3·5

3.2 Undyed cloths, each 10 cm. × 4 cm., and each composed of the fibre to be assessed for staining

3.3 Test control if desired (see § 7.3).

4. Specimen

4.1 If the textile to be tested is fabric, place a specimen of it, 10 cm. × 4 cm., on a piece of the undyed cloth (see § 3.2), and sew along all four sides to form a composite specimen.

4.2 If the textile to be tested is yarn, knit it into fabric and treat as in § 4.1, or form a layer of parallel lengths of it between two pieces of the undyed cloth and sew around the four sides to hold the yarn in place.

4.3 If the textile to be tested is loose fibre, comb and compress an amount at least equal in weight to one piece of the undyed cloth so as to obtain a layer 10 cm. × 4 cm. Place the layer between two pieces of the undyed cloth, and sew along the four sides to hold the fibres in place.

5. Procedure

5.1 Wet out the composite specimen in the sodium chlorite solution (see § 3.1), and immerse it in the solution without agitation at a temperature of 80 ± 2°C. (176 ± 4°F.) for 1 hr. The liquor ratio is 50 : 1.

5.2 Rinse the composite specimen in cold running tap-water for 10 min. Remove the stitching from the two long sides and one short side. Open out the composite specimen, and dry it at a temperature not exceeding 60°C. (140°F.) with the three parts in contact at the remaining line of stitching only.

5.3 Assess the change in colour of the specimen and the staining of the undyed cloths with the grey scales (see § 7.1).

6. Report

6.1 Report the numerical rating for change in colour of the specimen and for staining of the undyed cloth or cloths.

7. Notes

7.1 See the following sections—

(a) *Colour Fastness of Textiles: General Principles of Testing*

(b) *Colour Fastness of Textiles: Grey Scale for assessing Change in Colour*

(c) *Colour Fastness of Textiles: Grey Scale for assessing Staining.*

7.2 The concentration of sodium chlorite employed is determined by titration with sodium thiosulphate—

1 ml. of 0·1 M. thiosulphate solution ≡ 0·00226 g. $NaClO_2$

7.3 Unbleached cleaned cotton cloths may be used as test-control specimens. The degree of whiteness shown after the bleaching process indicates the effect of the test.

Colour Fastness to Washing: Mechanical Washing A

(Pp. 329, 63)

This test remains an ISO Tentative Test. The following amendment has been made—

3. Apparatus and Reagents

In § 3.2 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter 85% minimum

Colour Fastness to Washing: Mechanical Washing B

(Pp. 330, 65)

This test remains an ISO Tentative Test. The following amendment has been made—

3. Apparatus and Reagents

In § 3.3 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter 85% minimum

Colour Fastness to Washing at the Boil

(Pp. 332, 67)

This test has now been withdrawn.

Colour Fastness to Washing in the Presence of Sodium Hypochlorite

(Pp. 333, 69)

This test remains an ISO Tentative Test.

Colour Fastness to Perspiration

(Pp. 335, 71)

This test is still under discussion by ISO.

2. Principle

§ 2.1 should read—

2.1 . . . solutions containing histidine, drained, and placed . . .

Colour Fastness to Burnt-gas Fumes

(Pp. 337, 73)

This test is still under discussion by ISO.

Colour Fastness to Washing: S.D.C. No. 2

(Pp. 339, 75)

In § 3.2 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter 85% minimum

Colour Fastness to Washing: S.D.C. No. 4

(Pp. 340, 465, 77)

In § 3.3 the line "Combined fatty acids calculated as Na salts 85% minimum" should be replaced by—

Total fatty matter	85% minimum

Colour Fastness to Milling, Acid

(Pp. 341, 79)

No change.

Colour Fastness to Vulcanising

Two tests for colour fastness to vulcanising were accepted at the 1956 meeting of ISO as ISO Tentative Tests, but they are not included in this document, as it is probable that significant alterations will be made after further discussion. Copies of the tests can, however, be obtained from the offices of the Society.

Received 22nd November 1957

ERRATUM

Production of Dyes in Greece (J.S.D.C., **73**, 265 (June 1957))—The names of the three large dyemaking firms should be—Biochrom Aniline Dye Industry, Chromatourgeia Athinon, and Chromatourgeia Pireos.

Notes

Meetings of Council and Committees December 1957

Council—4th

Publications—17th

Colour Index Editorial Panel—19th

Society's Medals—4th

Examinations Board—30th

Death

We regret to report the loss by death of Mr. George E. Knowles, who joined the Society in 1902.

L. Morton Wood President of the Dyers and Finishers Association

Members will wish to congratulate Mr. L. M. Wood, Honorary Secretary of the Society, on his election in November 1957 as President of the Association, which is the employers' organisation for the woollen and worsted dyers in the West Riding of Yorkshire. In the D.F.A. Mr. Wood has occupied successively the offices of Vice-chairman and Chairman of the Labour Section, Vice-chairman and Chairman of the Slubbing Dyeing Section, and Vice-president of the Association, each for a period of three years.

International Federation—Congress in London 1959

The International Federation of Associations of Textile Chemists and Colourists has requested the Society to act as host to its next Congress, to be held in London during Wednesday–Friday, 16–18th September 1959. The congress centre will be Church House, Dean's Yard, Westminster, and the headquarters hotel will be Grosvenor House, Park Lane, at which a Dinner and Gala Ball will be held on the Friday evening. Further information can be obtained from the General Secretary, Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire.

A.S.D.C. Examination 1958

The annual examination for the Associateship of the Society of Dyers and Colourists will be held on Thursday, Friday, and Saturday, 29th, 30th, and 31st May 1958. Application forms are obtainable from the offices of the Society and must be completed and returned not later than 31st March 1958. Candidates should note that Papers A and B may be taken together, followed by C, D, and E; or papers A, B, and C may be taken together, followed by D and E.

The Chemistry of Plastics Symposium at Bradford 14-15th February 1958

The symposium and exhibition of apparatus and products are being organised by the Bradford Chemical Society in conjunction with the Department of Chemistry and Dyeing of the Bradford Institute of Technology (where they are to be held) and the Yorkshire Council for Further Education. The introductory lecture on the Friday evening will be given by Professor C. E. H. Bawn, C.B.E., F.R.S., his subject being *The Chemistry of Plastics and Polymers*. The lectures on the Saturday will deal with new polymers and plastics and the analysis and applications of plastics. Full details can be obtained from Dr. W. R. Moore, Bradford Institute of Technology, Bradford 7, Yorkshire.

The Society of Dyers and Colourists of Australia
Annual Report 1956-1957

The report of the Honorary General Secretary (Mr. J. Brear) was presented at the twenty-fifth Annual General Meeting of the Society, which took place concurrently in August 1957 in each of five States. The report reads as follows—

During the year 1956–1957 the Society of Dyers and Colourists of Australia has continued to consolidate its position in the industry, and there have been many indications of its increasing effectiveness, general recognition, and acceptance amongst the trade.

Five Sections, in the States of Victoria (including the Geelong Subsection), New South Wales, South Australia, Queensland, and Western Australia, have had successful years, and on the average ten ordinary meetings have been held in each area. In addition, there have been local social gatherings, including State annual dinners, annual balls, golf outings, etc. This total of more than 50 meetings throughout Australia is considered a very worthwhile achievement, and reflects the general interest in the Society within the Commonwealth. The standard of lectures has been maintained at a high level, and they have covered a wide variety of important subjects, including the latest developments in the processing of synthetic fibres and in new types of dyes and methods of dyeing generally.

Occasionally the attendance at the meetings has been a little disappointing, although on the average numbers have been well up to standard. We would, however, appeal to all members to support the fine efforts of the various State Committees and not to be backward in making suggestions and taking an active part in the proceedings of the Society.

Towards the close of the year Council approved the formation of an additional Section of the Society, which will operate in New Zealand. This follows an approach from several of our country members resident in the Dominion for recognition to form a Section of their own, and this new branch is now being established.

It is with profound regret that during the year we have lost two of our most valued honorary life members. We refer to the untimely deaths of Mr. J. A. Ferguson and Mr. L. P. Rendell, both of whom have given years of yeoman service in the interests of all members of the Australian Society.

With rising costs generally, the Council has considered it necessary to raise the level of subscriptions for the first time since the inauguration of the Society in Australia. It is felt that members will appreciate that this step was unavoidable.

Negotiations are proceeding with a view to bringing about a closer relationship with our parent body, the Society of Dyers and Colourists of England. When finality is reached it is believed that additional benefits will be available to all members.

The untiring work of our former President, Mr. Athol Burns, has been of outstanding value, and in his successor, Mr. W. H. Wainwright, we have a worthy President who has already shown his keen interest and sound ability to lead the Society.

The co-operation of all the sectional Honorary Secretaries and members of the Council and the Publications Editor has been very much appreciated during the year, and we move forward with confidence for the future.

Perkin Plaque unveiled at Greenford

An account is given in *The Dyer* (**118**, 755 (8th November 1957)) of the unveiling of a plaque commemorating the establishment of the dye-making factory at Greenford by William Henry Perkin and his brother. The plaque was commissioned by Ealing Borough Council from Mr. T. Porter, A.R.C.A., of the Ealing School of Art, and is fixed to one of the original factory buildings. It was unveiled on 30th October 1957 by Sir Robert Robinson, O.M. (Chairman of the Perkin Centenary Celebration), who was welcomed by the Mayoress of Ealing (Mrs. D. Williams).

Durasteel Ltd., the present occupiers, had acquired the factory early in 1935 from Hornett, Foster & Co. Ltd., producers of animal foods, and during the installation of plant had discovered many traces of colouring materials throughout the premises. The present factory was erected mainly in the 1920s, but the gatehouse cottage (now the canteen), the gatehouse bell, the office block, the works office, and the stores building date back to the days of Perkin & Sons.

One of the products of the present factory is corrugated translucent roofing material consisting of resin-bonded glass-fibre sheeting made in a range of colours, and this owes much to Perkin's original discovery.

Miss Betty Dix Perkin, a descendant of Sir William, presented a small piece of mauve cloth, originally dyed by him, to Mr. R. T. Cowper, chairman of Durasteel Ltd. The canopy erected especially for the unveiling was painted mauve, matched from one of the dye-stained bricks found in the buildings.

Editor of *The Dyer*

Mr. G. W. Bednall, formerly assistant editor, has been appointed editor of *The Dyer* in succession to Mr. L. E. Morris, who has been appointed to the board of directors of National Trade Press Ltd. and Heywood & Co. Ltd. In his executive capacity as group editor of the Heywood technical publications, Mr. Morris is responsible for a number of journals, including *The Dyer*.

American Dyestuff Reporter

According to an article in the issue for 4th November 1957 (**46**, 789) the *American Dyestuff Reporter* became forty years old on 8th October 1957. In 1916 a section of the *Dry Goods Guide* had been started as part of a campaign to explain to retailers the existing dye situation in the U.S.A. and to appeal for tariff protection. As interest grew, it was decided that the infant American dye

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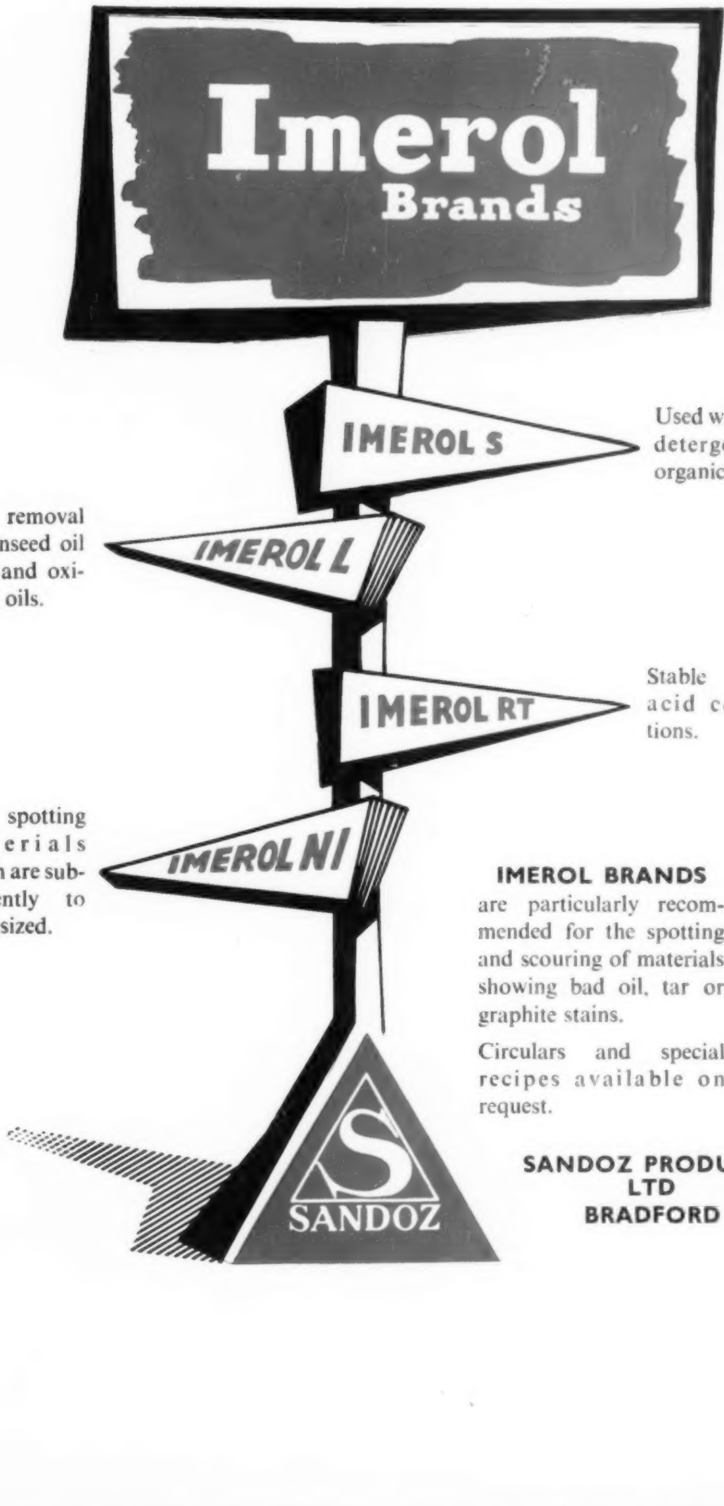

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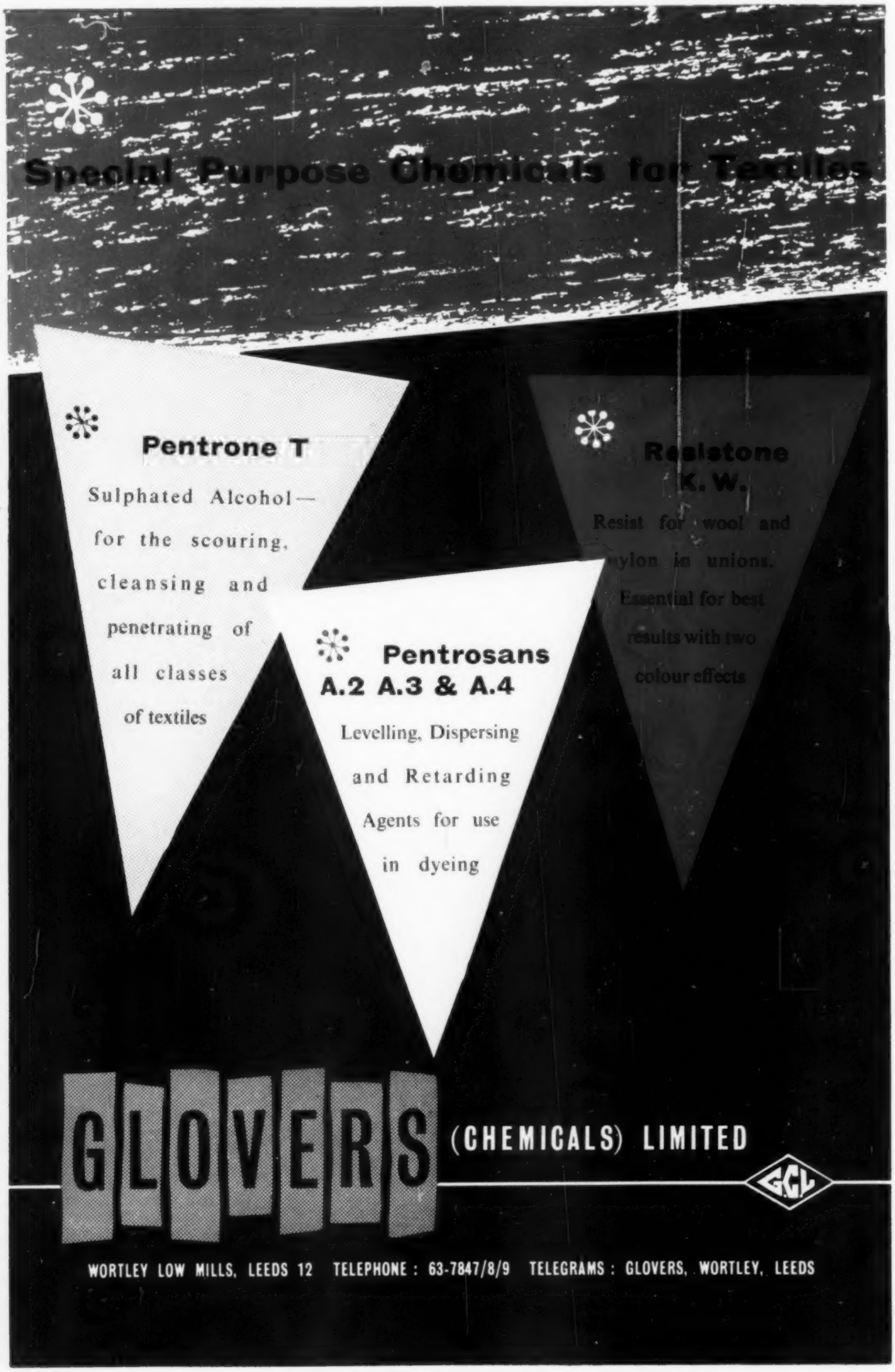
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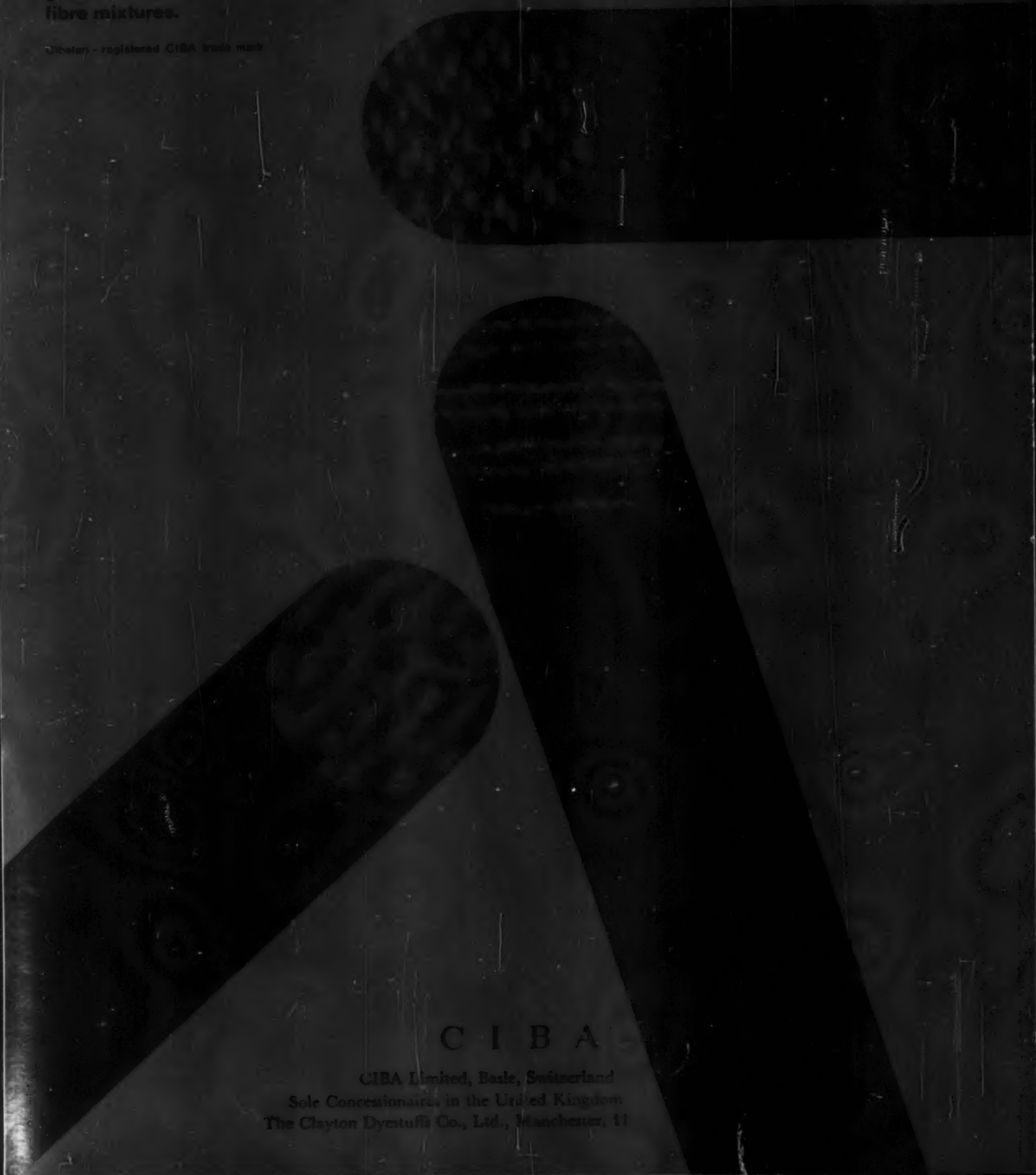

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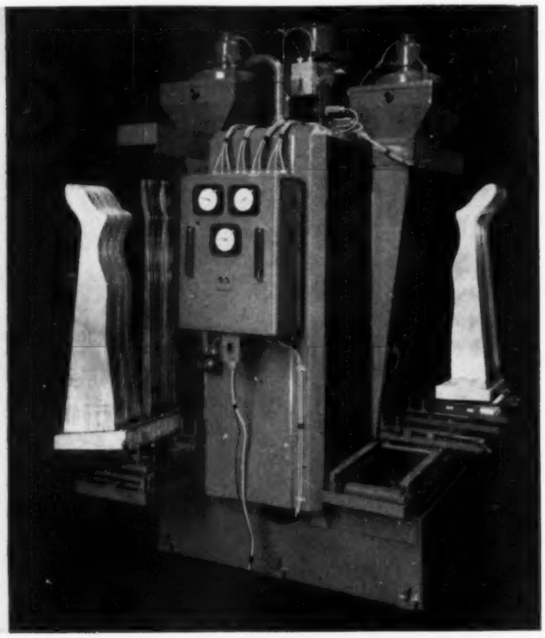

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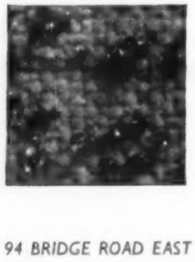

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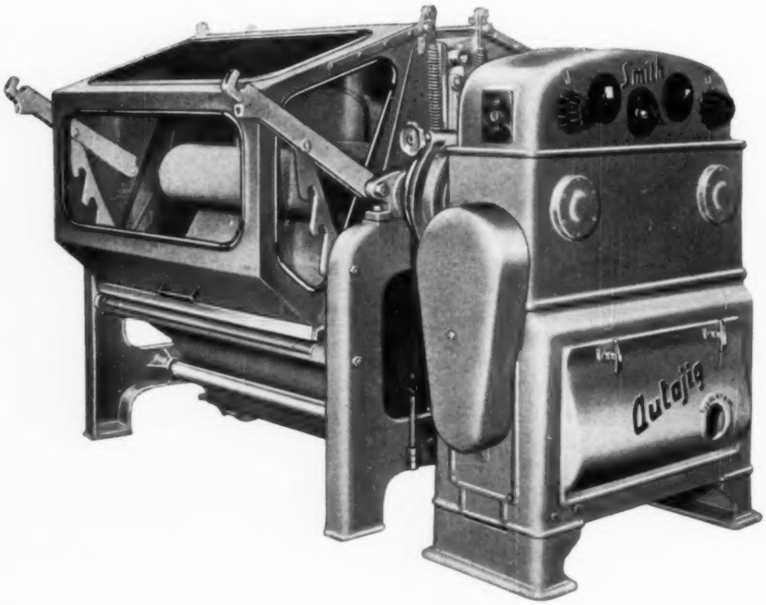

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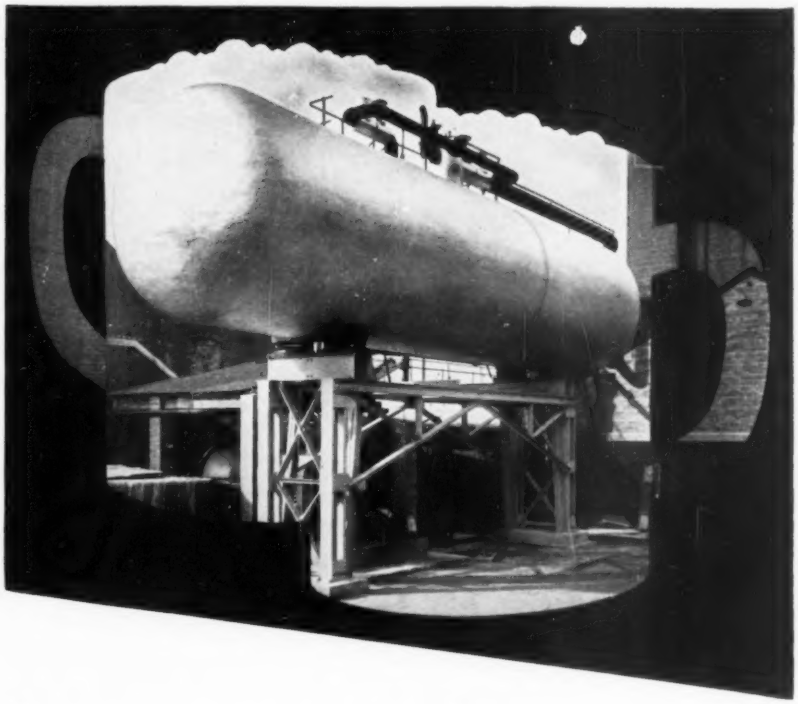

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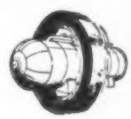

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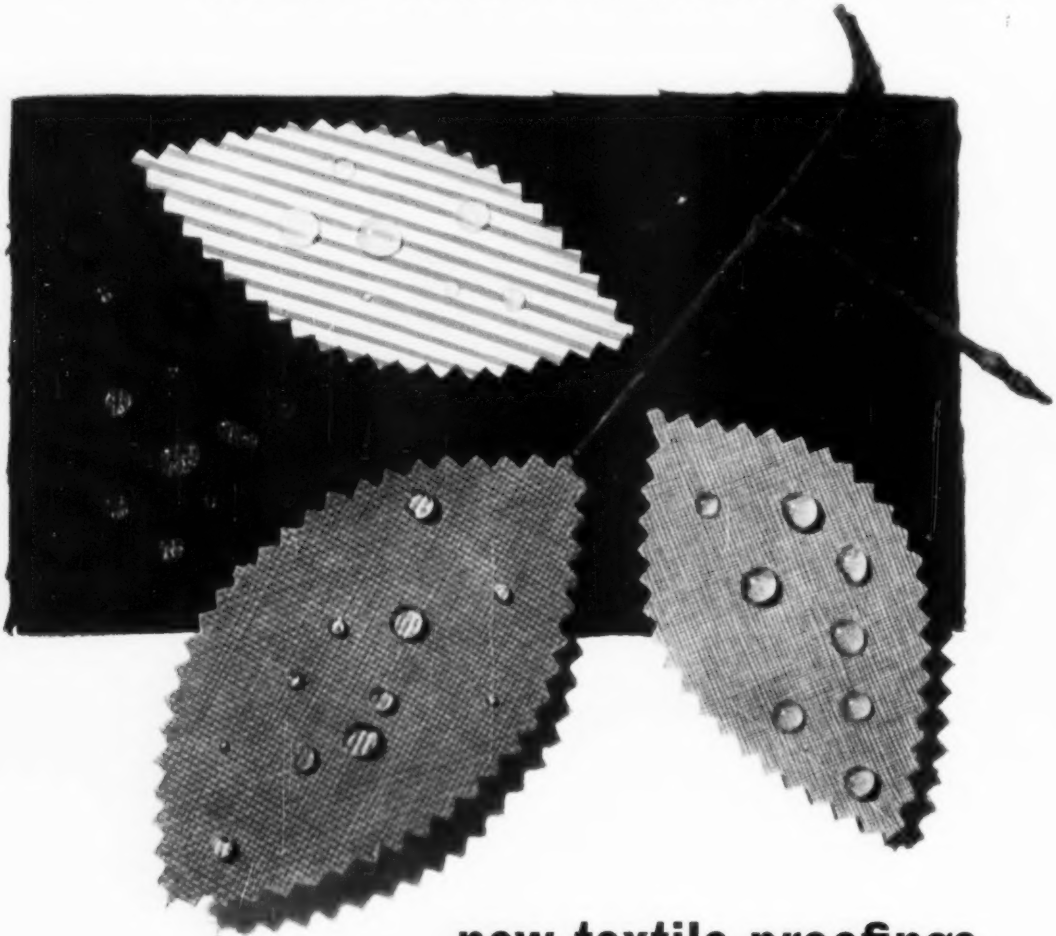

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industry could be better served by a separate publication circulating throughout the textile field, and the first weekly issue of the *Reporter* appeared on Monday, 8th October 1917, as a sixteen-page newspaper, 6 in. × 9 in. in size.

In August 1920 appeared the first issue of a monthly technical supplement to the weekly news edition, with Dr. L. A. Olney as Advisory Editor. An article by Dr. Olney in the September 1920 issue—*Standard Dye Tests and Standard Records*—and an editorial in the June 1921 issue finally led to the formation in September 1921 of the American Association of Textile Chemists and Colorists. The Howes Publishing Company offered the AATCC a portion of the pages of the *Reporter* free for a period of six months, and thereafter at cost (printing and distribution). When the Association became a corporate body, a contract was signed providing for the continuance of this service for fifty years; this agreement was revised in 1947 and 1957, and extended for a further fifty years.

Today, over 10,000 copies of the *Reporter* are printed, and the AATCC membership is over 7,100; the foreign circulation is over 1,500. We wish the *Reporter* continuing success in the future.

Jubilee of Continental Associations of Colourists

A very interesting article by Professor H. Perndanner of Vienna in the October 1957 issue of *Melliand Textilberichte* (**38**, 1142–1144) outlines what is in effect the history of the International Federation of Associations of Textile Chemists and Colourists, to which the Society now adheres. By the beginning of this century Königinhof (Dvur Králové) on the Elbe (now in Czechoslovakia) had forsaken the originally quite primitive printing of kalmucks, etc. and with its many printworks had become a Mecca for the technically trained young colourists from the excellent colleges in the old Austro-Hungarian Empire—at Reichenberg (Liberec), Prague, Vienna, Brünn (Brno), etc.—and from Mulhouse in Alsace. The writer claims that the Austrians have an inborn sense of fashion and colour harmony, so that some 70% of the colourists in Europe, and especially in Germany, were Austrian.

The colourists in Königinhof used to meet regularly at the round table in the German House to discuss problems and listen to talks from itinerant colourists from the dyemaking firms. As a result, the Königinhof *Symposion* decided to found an association of colourists, and an announcement over seventeen signatures appeared in the *Zeitschrift für Farbenindustrie* on 1st December 1908.

Up to the beginning of the Second World War the *Coloristen-verein* or *Verein der Chemiker-Coloristen* held twenty-one congresses, the first at Dresden in 1909 with a hundred members. This soon led to the Internationaler Verein der Textil-Chemiker und Coloristen, with sections in different countries. The official organ of the Association was *Lehnes Färberzeitung*. The second congress was held at Frankfurt-am-Main in 1910, and the headquarters were moved to Vienna. Subsequent congresses were held at Turin, Vienna, and Berlin (1913), when the membership had risen to 600, including 132 Austrians, 119 Russians and Poles, 65 Italians, and 42 Germans.

After the First World War the next (sixth) congress was held at Salzburg in 1921 with only fifty present. In 1922 (Innsbruck) Scandinavian, Polish, and Dutch sections were formed, but they did not prove viable. Subsequent congresses were held at Salzburg, Vienna, Zürich, Dresden, Carlsbad (Karlovy, Czechoslovakia), Heidelberg, Budapest, and Milan (1930). The Italian section seceded for political reasons, and the association joined the International Federation, with which it co-operated in holding the sixteenth congress at Paris in 1931. The political atmosphere became steadily more strained during the 1930s, but successful congresses were held at Marienbad (Máriánskě Lázně, Czechoslovakia) (1933), Basle (1935), Stuttgart, and Salzburg. However, after the twenty-first congress, held at Constance in 1938, the Internationaler Verein faded away.

Comparing present-day conditions with those of fifty years ago, Professor Perndanner points out that, apart from technical changes amounting to a revolution, the great increase in technical literature and technical service from the dyemakers has led to the young colourist losing the schooling of the works laboratory. Young colourists are paid far too little in relation to the enormous value of the goods which they have to handle, and this tends to frighten away young entrants to the profession. Teachers should have greater practical knowledge of textile finishing, and its fundamental principles should be transmitted to students, not crammed into them. Also, more attention should be paid in textile schools to advanced commercial knowledge, so that colourists may eventually reach leading positions in the industry.

Joint Meeting of the Society of Chemical Industry and the Italian Chemical Society

The joint meeting is to be held in Turin during 25th–31st May 1958. Offers of papers are invited notably for Session 4—Plastics, Fibres, and Textiles including Dyes. Further details can be obtained from the Society of Chemical Industry, 14 Belgrave Square, London S.W.1.

Ardil and Courpleta

Production of Ardil (ICI) regenerated protein fibre was discontinued during 1957. Also, following the merger of Courtaulds Ltd. and British Celanese Ltd., Courpleta (cellulose triacetate) has been renamed *Tricel C*.

British Rayon Research Association

Mr. John Wilson, who has been awarded the C.B.E., retired as Director of Research at the end of 1957, and was succeeded by the Deputy Director, Mr. L. A. Wiseman.

The tenth annual report of the Association (to

31st October 1957) states that the programme of research may be divided roughly into 25% fundamental research, 50% technological research, and 25% engineering development. Problems under investigation include the structure of cellulose from different sources, the dyeing and finishing of fibre blends, and the development of fluid-bed machines for dyeing and drying.

Recommended Definitions

During the past few years the Terms and Definitions Committee has published in the *Journal* tentative definitions of a number of scientific and technical terms of direct interest to members of the Society [1]. The Committee has now carefully revised these definitions and has added others, so that the definitions included in the accompanying alphabetical glossary should be regarded as definitely recommended by the Committee rather than as purely tentative. However, comments and criticisms are still welcome, and should be addressed *in writing* to the Editor and Technical Officer, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1, Yorkshire.

The asterisk (*) is used to indicate definitions based on the *Report on Colour Terminology* (London: The Physical Society 1948). The dagger (†) indicates that the definitions have been discussed with the Textile Terms and Definitions Committee of the Textile Institute.

[1] J.S.D.C., **68**, 180, 258, 306 (1952); **69**, 24, 121, 257, 448 (1953); **70**, 93 (1954); **71**, 144 (1955).

achromatic colour

See *colour*.

acid ageing†

Ageing in which a volatile acid is also present in the vapour around the material.

acid dye†

An anionic dye (q.v.) so called because many of the class are characterised by their substantivity for protein fibres, and are normally applied from an acid dyebath.

acid milling dye†

This term is widely used to describe a dye which is fast to milling.

Note— Use of this term is deprecated.

affinity†

The affinity of a dye for a substrate may be expressed as the difference, in gram-calories per gram-molecule, between the chemical potential of the dye in its standard state in the fibre and the corresponding chemical potential in the dyebath.

Note— Use of this term in a qualitative sense, synonymous with *substantivity* (q.v.), is deprecated.

afterchrome dyeing process

A method of dyeing in which the fibre is dyed with a chrome dye and afterwards treated with a chromium compound to form a dye–chromium complex within the fibre.

ageing†

Originally a process in which printed fabric was exposed to a hot moist atmosphere. At the present time the term is almost exclusively applied to treatment of printed fabric in moist steam in absence of air.

Ageing is also used in the development of certain colorants in dyeing, e.g. aniline black.

ager†

A steam chamber used for ageing printed or padded material.

anionic dye†

A dye which dissociates in aqueous solution to give negatively charged coloured ions.

antichlor†

A chemical used to remove residual active chlorine from materials.

azoic dyeing†

The production of an insoluble azo compound on a substrate by interaction of a diazotised amine **(azoic diazo component)** and a coupling component **(azoic coupling component).**

backwashing†

The scouring or rinsing of dyed or undyed sliver before or after gilling or combing.

barry

Descriptive of faulty fabrics which exhibit light and dark weft bars originating in e.g. lustre differences, slight differences in dyeing behaviour, or differences in pick spacing.

basic dye†

A class of cationic dye (q.v.) characterised by its substantivity for tannin-mordanted cotton.

bleeding†

Loss of dye from a coloured material in contact with a liquid, leading to an obvious coloration of the latter, or adjacent areas of the same or other material. (See also *marking-off.*)

blinding†

Marked and undesirable loss of lustre of fibres after wet processing. This may be due, for example, to the formation of dye or other particles within or on the fibre, which scatter light.

blotch†

The uniformly printed background of a pattern.

bottoming†

Dyeing a substrate for subsequent topping.

bowl

(*a*) A term applied to a roller forming part of a nip through which cloth is passed in textile finishing. Thus, two bowls are required to form a nip, the primary function of which is to draw cloth through a machine, but it may additionally apply liquid to, or express it from, the cloth; or, when part of a calender, it may mechanically deform the cloth surface.

(*b*) An open vessel for such wet treatments as wool scouring, crabbing, etc.

brightness†

That colour quality, a decrease in which may be compared with the effect of the addition of a small quantity of neutral grey dye to the dye, whereby a match cannot be made by adjusting the strength.

burl dyeing†

The coloration of impurities in woollen piece-goods by a modified dyeing process.

cake†

The package of filament yarns produced in the viscose spinning industry by means of the Topham box.

Note— In appearance it is almost cylindrical, and common dimensions are— height 3½ in., external diameter 6 in., internal diameter 4 in. It is not supported by any internal bobbin or tube.

cationic dye†

A dye which dissociates in aqueous solution to give positively charged coloured ions. (See also *basic dye.*)

chemic(k)†

Calcium or sodium hypochlorite.

chromate dyeing process

See *metachrome dyeing process.*

chromatic colour

See *colour.*

chrome dye†

A dye which is capable of forming a chelate complex with a chromium atom.

chrome mordant dyeing process

A method of dyeing whereby the fibre is treated in a solution of chromium compounds and subsequently dyed with a suitable chrome dye to yield a dye–chromium complex within the fibre.

clearing†
(*in printing*)

A mild bleaching treatment applied to printed materials with the object of removing traces of unwanted dye from, and improving the whiteness of, the uncoloured areas.

colloidal dyes

Water-soluble dyes which, in the dyebath under specified conditions, exist mainly as ultramicroscopic aggregates, only a small proportion being present as single molecules or ions.

colorant

A colouring matter, a dye or a pigment.

Note— This noun is recommended as a generic term without the connotations of physical form and method of coloration implied by the terms "dye" and "pigment".

colour*

(*a*) That characteristic of the visual sensation which enables the eye to distinguish differences in its quality, such as may be caused by differences in the spectral distribution of the light rather than by differences in spatial distribution or fluctuations with time.

(*b*) As (*a*), but applied directly to the stimulus or the source (primary or secondary) giving rise to the sensation. For brevity the stimulus is often referred to as the colour.

(*c*) That property of an object or stimulus, or quality of a visual sensation, distinguished by its appearance of redness, greenness, etc., in contradistinction to whiteness, greyness, or blackness (i.e. *chromatic colour* in contradistinction to *achromatic colour*).

colour matching

See *matching.*

colour value†

The ratio between the costs of the dyes yielding dyeings of equal visual strengths.

Note— In printing this term is synonymous with *tinctorial value* (q.v.).

compatible dyes†

Dyes which, when mixed together, behave in dyeing as a homogeneous dye.

Note— Compatibility in dyeing is usually assessed by means of a series of dyeings in which the time of dyeing or the total quantity of dye applied to the fibre is varied. If the dyeings so produced are all of very similar hue, then the dyes in the mixture are said to be compatible. On occasion the term may be extended to include fastness properties, dyeings of compatible dyes remaining of the same, or nearly the same, hue when subjected to fading or washing tests.

couple†
(*verb*)

To combine a suitable organic component, usually a phenol or an arylamine, with a diazonium salt in such a way as to form an azo dye.

coupling component

See *azoic dyeing.*

crabbing†

A preliminary setting treatment given to fabrics composed wholly or partly of wool or hair with the object of improving dimensional stability in the subsequent wet processing at temperatures not exceeding those obtaining during the treatment, which consists in immersing the fabric in a hot or boiling aqueous medium whilst under tension, and cooling whilst still held in the desired position.

cross dyeing†

The dyeing of one component of a mixture of fibres after at least one of the others has been dyed already.

cuprous-ion method

A process in which polyacrylonitrile fibres are dyed with acid dyes by the gradual production of cuprous ions in the dyebath.

deep*

Adjective applied to colour produced by the application of a relatively large amount of dye.

depth*

That colour quality, an increase in which is associated with an increase in the quantity of dye present, all other conditions (viewing, etc.) remaining the same.

developer

A substance used to couple with a diazotised dye or base on the fibre. (See *azoic dyeing.*)

developing†

A stage in dyeing or printing during which leuco compounds, dyes, or dye intermediates already on the fibre are converted into the final colouring matter.

diazo component

See *azoic dyeing.*

direct cotton dye
(direct dye)†

An anionic dye having substantivity for cellulosic fibres, normally applied from an aqueous dyebath containing added electrolyte.

discharge†

Destruction by chemical means of a dye or a mordant already present in a fibre.

discharge printing (style)†

A method of printing in which dyed fabric is printed with a chemical composition which destroys the dye locally to give a white pattern, and in which a second dye may be applied simultaneously with the discharge to produce a pattern of a different colour.

disperse dyes†

A class of substantially water-insoluble dyes originally introduced for dyeing cellulose acetate, and usually applied from fine aqueous suspensions.

dolly†

(*a*) A machine in which cloth pieces sewn end to end are circulated repeatedly through a liquor by means of a single pair of squeeze rollers above the liquor.

(*b*) A machine in which lace, hosiery, or knitwares are subjected to the action of fallers while immersed in a detergent solution and carried in a moving rectangular or cylindrical box.

(*c*) An open-width washer, containing 3–5 compartments, originally used for dunging aged cotton prints, and now also used for any open-width washing where a shorter machine than an open soaper is desired.

dope-dyed

See *spun-dyed.*

dry-clean†

To clean garments or fabrics by treating them in an organic solvent, as distinct from an aqueous liquor.

dullness†

That colour quality, an increase in which may be compared with the effect of the addition of a small quantity of neutral grey dye to the dye, whereby a match cannot be made by adjusting the strength.

dunging

The operation of passing goods printed with aluminium and iron mordants, aged to achieve partial fixation, through a liquor made by letting down cow-dung with water or alternatively through a solution of cow-dung substitutes, in order (i) to complete fixation of the mordants, (ii) to precipitate any unfixed mordants which wash out before they can be fixed where printed, and (iii) to remove printing thickening as completely as possible.

dye†

A coloured substance which has affinity (q.v.) for a substrate, either inherent or induced by appropriate reactants.

dye-fixing agent†

An organic product capable of improving the fastness to water or washing of a dyed or printed material.

effect threads†

Threads, inserted into a fabric during manufacture, of such a character that they will present a different appearance from that of the bulk of the fabric in the final material.

empty

See *pale*.

ending†

Uneven dyeing consisting in a continuous change in colour from one end of a length of fabric to the other, or a difference in colour between the bulk and the end of a length of fabric.

exhaustion†

The ratio at any stated stage between the amount of dye or other substance taken up by the substrate and the amount originally available.

flash-ageing

Very rapid reduction and fixation obtained when a fabric printed with dispersed vat dyes and a thickener capable of being insolubilised by alkalis is padded with a solution of caustic soda and sodium hydrosulphite and passed immediately into air-free steam.

fluorescent brightening agent

A substance which is added to an uncoloured or a coloured substrate to increase the reflectance of the latter in the visible region by conversion of ultraviolet radiation into visible light and so increase the apparent whiteness or brightness of the substrate.

full

See *deep*.

grey†

Descriptive of yarn as spun or fabric as knitted or woven before it has been scoured, bleached, dyed, or printed.

hue*

That attribute of colour whereby it is recognised as being predominantly red, green, blue, yellow, etc.

jig†

A dyeing machine in which fabric in open width is transferred repeatedly from one roller to another through a dyebath of relatively small volume.

jigger

See *jig*.

kier boiling (kiering)†

Prolonged boiling of natural cellulosic materials with alkaline liquors in a large steel container **(kier)** at atmospheric pressure or above.

Lancashire jigger

See *jig*.

leuco dye†

A reduced form of a dye from which the original dye may be regenerated by oxidation. (See *vat dye*.)

levelling†

Migration of dye leading towards uniform coloration of dyed material.

levelling acid dye

An acid dye which migrates readily in the presence of dilute acid.

levelling agent

A speciality chemical used with any class of dye to produce a more level result or to obtain a level result in a shorter time.

liquor ratio†

The ratio of the weight of liquor employed in any treatment to the weight of material treated.

listing†

An uneven defect consisting in a variation of colour between the selvedges and the rest of a dyed fabric.

marking-off

Undesirable transfer of colouring matter by contact from a dyed or printed material to other material. (See also *bleeding*.)

matching†

The process by which the proportion of each colouring matter present in a material is adjusted so that the final colour resembles that of a given sample as closely as possible.

mélange printing†

A printing process in which bands of thickened dye paste are applied, with intervening uncoloured areas, across wool or other sliver or slubbing, which is subsequently steamed, washed, and then gilled to produce an even mixture of dyed and undyed lengths of fibre.

metachrome dyeing process

A method of dyeing in which the fibre is treated in a dyebath containing a suitable chrome dye together with a chromate, whereby a dye–chromium complex is formed within the fibre.

metal-complex dyes

Co-ordinated metal–dye complexes used mainly for wool colouring and polyamide fibres. There are two main types— complexes of one atom of metal with one molecule of dye generally applied from a relatively strong sulphuric acid dyebath and complexes of one atom of metal with two molecules of dye generally applied from a neutral or weakly acid dyebath.

migration†

The movement of dye or pigment from one part of a coloured material to another.

Note— This term is frequently used in a derogatory sense to describe a movement of dye or pigment during processing, and particularly during drying, which leads to an uneven dyeing or to two-sided effects in fabrics.

milling dye†

A dye which is fast to acid or alkaline milling.

mock cake†

A package of yarn produced by winding on to a collapsible mandril or former, which is removed after the package has been formed. Usually the package has the same dimensions as a rayon cake.

Note— It is usually built up from the inside to the outside, in contradistinction to the cake.

mordant†

A substance which is applied to a fibre to form with a dye a complex which is retained by the fibre more firmly than the dye itself.

mordant dye†

A dye which is fixed with a mordant, usually a metallic mordant. The term is normally applicable to chrome dyes on protein and polyamide fibres or in calico printing.

onium dye†

A water-soluble cationic dye in which the ionisable group is an ammonium, sulphonium, phosphonium, or oxonium radical.

optical bleaching agent

See *fluorescent brightening agent.*

optical brightening agent

See *fluorescent brightening agent.*

pack dyeing†

A method of dyeing in which the liquor is circulated through a batch of goods which remains stationary.

Note— The use of the term "pressure dyeing" (q.v.) is deprecated in this connection.

package dyeing

A method of dyeing in which the liquor is circulated between the centre and the outside of a wound package in either direction.

pad–bake

A process involving impregnation, drying, and treatment in a heated zone at a temperature commonly above 100°c.

pad–develop

Developing (q.v.) on the pad.

Note— The use of the term "pad–develop" for a two-stage process consisting of padding followed by development in a subsequent operation is deprecated.

padding†

Impregnation of material by passage through a short liquor and subsequently or simultaneously through squeeze rollers.

Pad–Roll

See Eriksson, C. O., Landqvist, N., and Mellbin, B., J.S.D.C., **71**, 894 (1955).

pad–steam process†

A process of continuous dyeing in which fabric in open width is padded with dye and any necessary assistants, and is then steamed.

pale*

Adjective applied to colour produced by the application of a relatively small amount of dye.

pigment†

A substance in particulate form which is applied to bodies by mechanical incorporation, by chemical precipitation, or by coating to modify their colour and light-scattering properties.

pigment padding†

The application of vat dyes by padding with an aqueous dispersion of the unreduced vat dyes.

postboarding

The operation of setting knitted garments, garment shapes, or hose composed of thermoplastic fibres by an operation similar to preboarding (q.v.), carried out as a finishing operation.

potting†

A finishing process for wool cloths in which a roll of fabric is treated in water at 70–100°c. for several hours, then allowed to cool slowly, and finally immersed in cold water to set the fabric.

preboarding†

The operation of setting knitted garments, garment shapes, or hose composed of thermoplastic fibres by subjecting them, before dyeing and whilst supported on a former, to a temperature higher than that of any subsequent operation, followed by cooling before removal from the form. (The setting may be carried out by the action of either moist heat or dry heat.)

premetallised dyes

See *metal-complex dyes.*

pressure dyeing†

Dyeing under superatmospheric pressure primarily with the object of raising the temperature of the dye liquor above its normal boiling point. (See also *pack dyeing.*)

Note— Use of the terms "static pressure dyeing" and "high-temperature dyeing" is deprecated.

rate of dyeing†

The rate at which a standard weight of dye is absorbed by a standard weight of substrate under specified conditions. It may be expressed quantitatively in several ways, such as the weight of dye absorbed in unit time, the percentage of dye absorbed in unit time, or the time taken for the substrate to absorb a given fraction of the amount of dye which it will absorb at equilibrium.

reactive dye

A dye which, under suitable conditions, is capable of reacting chemically with a fibre to form a covalent dye–fibre linkage.

reserve printing (style)

See *resist printing (style).*

resin-fixed pigments

A term applied to colorants for dyed or printed textile materials wherein the coloured effects are due to the presence on the surface of the fibres of finely divided pigment embedded in a film of synthetic resin.

resist†

A substance applied to a substrate to prevent the uptake or fixation of a dye or a finishing agent in a subsequent operation.

The substance may function either by forming a mechanical barrier, by reacting chemically with the dye or finishing agent, or by altering conditions (e.g. pH value) locally so that development cannot occur.

resist printing (style)†

A method of printing in which undyed material is printed with resists to give on subsequent dyeing or developing a white pattern on a coloured ground, or a pattern of contrasting colour to the ground by incorporating suitable dyes in the resist print paste.

restraining agent†

A product which, when added to a dyebath, reduces the equilibrium exhaustion.

retarding agent†

A product which, when added to a dyebath, reduces the rate of dyeing, but does not affect the final exhaustion.

salt sensitivity†

(*a*) (*in dyeing*)

The extent to which the dyeing properties of a dye are affected by the addition of a neutral electrolyte.

(*b*) (*of coloured or printed fabric*)

The susceptibility of coloured material to change in colour when spotted with aqueous solutions of neutral electrolytes.

scouring†

Freeing textile materials from natural or other non-fibrous constituents by treatment with detergent solution.

setting†

The process of conferring stability of form on yarns or fabrics, generally by means of hot water or moist or dry heat.

shade

(*noun*)

The definition of the colour when it is not expressed directly in terms of the light selectively reflected from, or transmitted by, the body or of the corresponding subjective impression, but by analogy of association of ideas, e.g. mode shade, lavender, eau-de-nil.

(*verb active*)

To shade, to bring about relatively small modifications in the colour of a body; in dyeing, by the addition of small proportions of dye in comparison with those already present, especially with the object of matching more accurately with a given pattern.

skitteriness†

An undesired speckled effect in a yarn or a fabric arising from differences in colour or in depth of dyeing between adjacent fibres or portions of the same fabric.

slop padding

Padding through a long liquor.

spun-dyed†

Descriptive of manufactured fibres in which the colouring matter has been incorporated before the filament is formed.

Note— This term does not imply any specific fastness properties.

staining†

(*a*) (*in textiles*). An undesirable local discoloration.

(*b*) Coloration of leather, paper, wood, and some other substrates by surface application of a dye solution.

stoving

Bleaching wool, silk, hair, or other materials in a moist condition with sulphur dioxide in a chamber. (*Wet stoving* is treatment of a material with a solution of sulphur dioxide.)

strength

See *depth*.

strike†

The initial rate of dyeing.

stripping†

Destroying or removing dye or finish from a fibre.

strong

See *deep*.

style

(*printing*)

A term indicating concisely, though not necessarily completely, how a print is produced by reference either to the process, to the class or classes of dye used, or to both.

substantivity

Substantivity is the attraction between a substrate and a dye or other substance under the precise conditions of test whereby the latter is selectively extracted from the application medium by the substrate.

sulphur dye†

A water-insoluble dye which is normally applied in the soluble reduced form from a sodium sulphide solution and subsequently reoxidised to the insoluble form on the fibre.

swealing†

Undesirable migration of dye occurring between the dyeing and the drying of material.

temperature-range properties†

(*of a dye in a particular dyeing system*)

A qualitative technical evaluation of the behaviour of a dye obtained by examination of the influence of temperature on the uptake of dye in a given time under specific conditions.

tinctorial value

The intensity of colour obtained when a standard weight of dye is applied to a substrate under specified conditions. (See also *colour value*.)

tippy wool†

Wool in which the tip portions of the fibres have been so damaged by natural weathering as to have markedly different dyeing properties from the root portions.

topping†

The application of further colouring matter, not necessarily of the same hue or class, to a dyed substrate in order to adjust the latter to the desired final colour.

union dye†

A dye or a mixture of dyes which will yield an apparently uniform colour on the fibre mixture for which it is devised.

union dyeing

The dyeing of any textile material composed of a mixture of different fibres.

vat†

(*noun*)

(*a*) A vessel in which the wet processing of textiles is carried out.

(*b*) A liquor containing a reduced (leuco) vat dye.

(*c*) See *vat dye*.

(*verb*)

To bring a vat dye into solution by the combined action of alkali and reducing agent.

vat dye

A water-insoluble dye, usually containing keto groups, which is normally applied to the fibre from an alkaline aqueous solution of a reduced enol (leuco) form, the latter being subsequently reoxidised in the fibre to the insoluble keto form.

Vigoureux printing

See *mélange printing*.

weak

See *pale*.

wet stoving

See *stoving*.

New Books and Publications

Hydrogen Ions
Their Determination and Importance in Pure and Industrial Chemistry
Volume One

By Hubert T. S. Britton. 4th edition 1955. Pp. xix + 476. London: Chapman & Hall Ltd. Price, 75s. 0d.

Almost everybody knows how to use pH values and many people can even measure them; hardly anyone really understands what the values mean.

This is not such a shocking state of affairs as it might seem, for even children are permitted to switch on television sets without first having to understand the principles of the oscilloscope. The old-time dyer who used his tongue to taste whether the dyebath was "sour" enough can be said to have carried a portable pH-meter with him, and one can say "high and low pH" instead of "alkaline and acidic" without causing too much misunderstanding of what one means.

But if one wishes to use pH values more precisely, or to understand what they mean and how they are measured, Britton's standard monograph will be indispensable. Most of this 1955 fourth edition is so like the 1942 third edition (whose 420 pages are sufficiently well known not to need description here) that this review need only outline what is contained in the extra 56 pages.

An additional chapter of 44 pages provides valuable details of the preparation of standard solutions and how reference electrodes are to be standardised together with a thorough discussion of the pH scale in terms of hydrogen ion activity. In this, the difficulty of rigorously defining the meaning of pH is thoroughly discussed, and the reasons for the modern method of arbitrarily defining 0·02 N. potassium hydrogen phthalate at 15°C. as having a pH value of 4·00 are lucidly explained.

Included are twelve new figures describing modern electrodes, salt bridges, and circuits, or graphs of such things as the effect of neglect of temperature correction. Two half-tone plates of the Lindemann electrometer and the Cambridge potentiometer box are omitted, rightly because they illustrated nothing beyond the outward appearance of the apparatus. There are six new tables of the properties of glass as an electrode material, its composition, how it is affected by drying and rewetting, its time of response to change of pH of the solution in which it is immersed, the effect of temperature and the concentration of sodium ions. Other new tables give the standard potential of that very useful electrode, the silver/silver chloride electrode, at different temperatures, and the variation of the dissociation constant of water with temperature. Unfortunately, the latter does not draw the conclusion that the pH of pure water is 7·00 only at 25°C., falling to about 6·5 at 0°C. and rising to about 7·5 at 60°C., a fact not usually appreciated but following from the data in the latter table.

The only other fault I can find in this book is the mis-spelling of the name of the famous biochemist, Krebs. The book is beautifully printed, and although the price is high, this new edition ought to be available in all research laboratories as an authoritative work of reference.

L. PETERS

pH Measurements
Their Theory and Practice

By Victor Gold. Pp. 125. London: Methuen & Co. Ltd. (Methuen's Monographs on Chemical Subjects). 1956. Price, 9s. 6d.

John Boulton once characterised a lecture he gave on the physical chemistry of dyeing as "the poor man's Vickerstaff". This book could similarly be called "the poor chemist's Britton". It has almost all the virtues of the latter but is brief. Its brevity makes it easy to read and understand, and the important formulae are outlined in a frame so that they can easily be memorised, but there is no loss of rigour even though the explanations are made simple.

The treatment is extended to solvents other than water— rarely touched on in larger texts— and even includes appendixes giving calculated values of useful constants, pH standards at 5° intervals from 0° to 95°C., a handy abbreviated table of three-figure logarithms, and a table of values at different temperatures of $\frac{1}{2}pK_w$, the pH of pure water, showing the wide variation from 7·47 at 0°C. to 6·51 at 60°C. The well known simplifications for a solution of a weak acid (dissociation constant K) alone—

$$pH = \tfrac{1}{2}(pK - \log[\text{Acid}])$$

and in presence of its salt—

$$pH = pK - \log \frac{[\text{Acid}]}{[\text{Salt}]}$$

are, however, inexplicably omitted.

Nevertheless, where Britton should be kept as a reference book, Gold should be read and studied, not only by candidates for the Associateship of the Society but also by all who use pH values.

L. PETERS

Technologie und Chemie der synthetischen Fasern aus Polyamiden

By Hermann Klare. Pp. 251. Berlin: VEB Verlag Technik. 1954. Price, DM 23.00.

With the evidence of recent achievements plain to see or hear, there can be few people now who still remain unimpressed to some extent at least by the reality of scientific developments in communist countries. But even if we allow that there have been cases of wilful blindness on the part of the West to technical advances in the self-styled democracies under Soviet control, it can be fairly claimed that at any rate the *textile* technologist in this country has been fully alive to developments in those countries. The significance of Klare's own

work on continuous polymerisation (the VK—vereinfacht-kontinuierlich— simplified continuous process) was recognised at the time it was published in specialist East German journals. Similarly, important work by the Germans Böhringer, Wiloth, Schlack, Ludewig, and Bobeth, by the Russian Korshak and his team, and by the Polish researchers Turska-Kusmierz, Chrzczonowicz, and Dyniewsky, all bearing on aspects of caprolactam polymerisation and 6-nylon production, has been followed with keen interest by British workers in the field.

As Klare states in his preface, the technology of the actual production process has never been given quite adequate treatment in the literature on fibre-forming synthetic high polymers published in the preceding two years, either in Germany or elsewhere. He now sets out to fill that gap and presents a conspectus of the whole field, including its chemistry, based on widely scattered data (he quotes over 240 references) and his own experience, linking up with work carried out at the Thüringisches Kunstfaserwerk "Wilhelm Pieck" at Schwarza.

Although a brief account is given of the history of the development of man-made fibres in general, together with an outline of linear high polymers that can be spun into fibres, including polyesters and polyacrylonitrile, the book as a whole is confined to a study of polyamide fibres and Perlon or 6-nylon in particular, partly because the basic principles of melt-spinning and cold-drawing were formulated from work done on polyamides and partly because it is this field that offers the greatest accumulation of experience.

As the publication date indicates, the reader will look in vain for any information on developments since 1954. Nor, as suggested above, will he find a great deal about matters outside the fields of polymerisation, spinning, and textile processing. Dyeing, for instance, is given one short paragraph on p. 232 (where it is reassuring to learn that "the dyeing of polyamide fibres does not present any fundamental difficulty"). Within its limits, however, the book with its 60 photographs and 44 diagrams gives an orderly and detailed survey of its subject, and even includes some hitherto unpublished data from the Perlon laboratory at the Schwarza factory relating to the production of basic material.

F. E. Wallwork

Annual Reports on the Progress of Chemistry for 1956

Volume LIII

London: The Chemical Society. 1957. Pp. 480. Price, 30s. 0d.

This Report deals with the subject-matter under the same six main headings as were used last year.

Inorganic Chemistry— A systematic study of the ultraviolet spectra of solutions of sodium nitrite in aqueous sulphuric acid shows that below 40% acid the spectrum is essentially that of nitrous acid, and above 70% acid it is that of the nitrosonium ion NO^+; at intermediate concentrations the nitrous acidium ion $H_2NO_2^+$ is an important constituent. Similar results are obtained for solutions of sodium nitrite in aqueous phosphoric acid, but in concentrated hydrochloric acid there is almost total conversion into nitrosyl chloride.

Organic Chemistry— This section commences with a brief review of work published during the past two years concerning the theoretical methods and chemical applications of quantum organic chemistry, nearly all of which has been based on the molecular-orbital approximation procedure and the assumption that σ- and π-electrons can be treated separately. Thereafter, the theoretical section is concerned mainly with— (*a*) the interplay of steric and electronic factors, including *d*-orbital resonance in organic compounds containing sulphur and phosphorus, and its effect on the reactions of organic compounds, (*b*) transfer of hydride ion, (*c*) intermediates containing bivalent carbon, (*d*) intramolecular rearrangements, and (*e*) electrophilic and nucleophilic substitution processes in the aliphatic field. Striking features of recent work are Isler's industrial synthesis of β-carotene, and the preparation of complexes of aromatic hydrocarbon with metal atom or ion, especially dibenzenechromium(0), $(C_6H_6)_2Cr$, in which the electronic configuration of the chromium atom is the same as that of the iron atom in ferrocene; this fact is of outstanding importance, since it indicates that the orbitals of suitable transition metals can be filled with all the π-electrons of an aromatic system up to the configuration of the next inert gas. The wide variety of available catalysts has been further extended by the use of rhodium for the reduction of resistant heterocyclic compounds, and of ruthenium for saturation of aromatic nuclei without hydrogenolysis of oxygen-containing groups. Attention is drawn to recent reviews of the tautomerism of phenols, and of the chemistry of the phenolic and natural tannins. The reaction concludes with a brief review of the chemistry of lignins, which was last reported in 1942.

Biological Chemistry— Work on the oxidative metabolism of aromatic compounds by micro-organisms is now surveyed for the first time on account of its useful applications to the destruction of herbicides (by soil bacteria) and to the disposal of aromatic wastes in sewage.

Analytical Chemistry— Microwave spectroscopy is here treated in some detail, because hitherto it has received but passing mention. More widespread applications of the high-frequency titration technique with the corresponding instrumentation are reported. In classical analysis, pride of place must go to the many and varied applications of ethylenediaminetetra-acetic acid (EDTA), both as a masking agent and as a titrant.

The value of the Report is enhanced by an author index, a subject index, and 4,285 references, many of them composite, taken from 710 journals and other publications. The individual chemist who is liable to be faced in his work with almost any variety of problem will find it useful to have this Report handy.

H. H. Hodgson

Die auf Grau abgestimmte Farbwiedergabe im Dreifarbenbuchdruck

By K. H. Schirmer (*Forschungsberichte des Wirtschafts- und Verkehrsministeriums Nordrhein-Westfalen* No. 155). Pp. 40. Cologne: Westdeutscher Verlag. 1955. Price, DM 10.00.

When magenta (M), yellow (Y), and cyan blue (C) are overprinted to reproduce a grey scale, using equal half-tone dot sizes on all plates for each step of the scale, the printed scale is reddish or brownish. The difficulty is due to the imperfections of the pigments concerned. It is shown to be fundamentally impossible to reproduce grey by equal dot sizes of the standard three-colour inks. Complications arise because, unlike colour photography, additive as well as subtractive colour effects occur together.

It is essential to use different dot sizes for each colour Y, M, and C for every particular grey tone. It is shown that Y and M dots are always of approximately the same size, but the C dot may be as much as twice this size in the highlights, varying towards the same size in the shadows. Errors of 5% in dot size cause obvious discoloration.

A summary of the mathematical treatment using the Neugebauer equations and the C.I.E. definitions of the M, Y, and C inks and of their overprints—R, G, and B— is given, showing that it is possible, assuming a value for the C dot, to solve three simultaneous equations (in X, Y, and Z respectively) to obtain the other three unknowns, namely the Y and M dot sizes and the density of the resultant print. This latter is plotted against the C, Y, M dot sizes, and the family of three curves is given. Alterations of inks alter these curves.

Difficulties due to ink squash in letterpress printing and uneven inking of dots are overcome by densitometer readings; e.g. the dot size of a given M tint is taken as being that of a tint composed of perfect dots having the same G reflectance as the given tint [Dot size = (1 − G reflectance of tint) − (1 − G reflectance of solid M), where 1 = G reflectance of paper; M and G are complementary].

Experiments were carried out printing in the order Y, M, C, also M, Y, C, and C, Y, M. The variations in grey so produced from a set of corrected plates were small compared with those from a complete change to "equal-dot" plates.

It is pointed out that a colour-reproduction system must be capable of reproducing grey, and that this fact is a guarantee of the ability of the system to reproduce colour.

The inference is that good results can be obtained by an automatic process, adjusted to the inks and the paper in use, which corrects each plate from *its own* separation, without reference to the other separations, i.e. colour masking, or electronic solution of the Neugebauer equations, is unnecessary. The author's evidence seems sound, at least for colours of low saturation, as most colours are.

It is suggested that the dot size correction should be carried out photographically, so that, with standardised etching (e.g. electrolytic) colour-corrected printing plates are produced directly from the half-tone negative. To do this it is proposed that for the R negative the exposure should be made through a negative continuous-tone mask of the original (by the R filter again), made on a process plate developed in a high-contrast metol–quinol developer, this distorting the final half-tone red negative to the correct degree. The G and B half-tone negatives are made normally, with no masks.

L. Moore

New Books received

Report on the Census of Production for 1954. Volume 2. *Industry B. Dyes and Dyestuffs.* Board of Trade. London: Her Majesty's Stationery Office, 1957. Pp. 9. 1s. 9d.

The Finishing Touch. M. Dendermonde and C. Blazer. Goor, Holland: N. V. Twentsche Stoombleekerij. 1957. Pp. 96. No price.

Vergelijkende Beoordeling van Enkele Lichtechtheidsmeters. L. F. C. Friele and H. J. Selling. Mededeling No. 115. Delft, Holland: Vezelinstituut T.N.O. April 1957. Pp. iii + 29. Dutch Guilders 11.25.

Colouring Matter in Food Regulations, 1957. No. 1066. *Food and Drugs.* Ministries of Agriculture, Fisheries and Food, and of Health. London: Her Majesty's Stationery Office. Pp. 8. 5d.

Man-made Fibres. R. W. Moncrieff. London: National Trade Press Ltd. 3rd edition 1957. Pp. x + 661 + 215 illustrations. 65s. 0d.

Intermediates and Dyestuffs. H. E. Nursten. Reprint from the Reports on the Progress of Applied Chemistry. Volume 41. 1956. London: Society of Chemical Industry. Pp. 33. No price.

Organic Chemistry. Electronic Theory and Reaction Mechanism. R. I. Reed and S. H. Tucker. London: Macmillan & Co. Ltd. 1956. Pp. viii + 108 + Tables A and B. 15s. 0d.

Textile Terms and Definitions. 3rd edition. Manchester: Textile Institute. Feb. 1957. Pp. 112. 12s. 6d. plus 8d. postage.

Light, Colour, and Vision. Yves le Grand. Translated by R. W. G. Hunt, J. W. T. Walsh, and F. R. W. Hunt. London: Chapman & Hall Ltd. 1957. Pp. xiii + 512 + 125 illustrations. 63s. 0d.

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes.
Any publication abstracted may be referred to by members of the Society on application to
Dr. C. B. Stevens, Dyeing Department, Leeds University

Imperial Chemical Industries Ltd.

Textile Printing on Brenthol Prepares— This card contains prints on cotton cloth of all the Brentamine Fast Bases and salts of interest for producing insoluble azo combinations by printing on padded Brenthol grounds. The six Brenthols suitable for this purpose because of their low substantivity are Brenthols AT, AS, OT, FR, PA, and MN (in order of increasing substantivity). In addition to the 162 prints produced with various azoic combinations based on these 6 Brenthols, 11 more prints are included of Alcian X dyes, and the chrome dyes, Chromazol Yellow CR and Blue G, Solochrome Cyanine R, and Fast Printing Green S, on Brenthol-prepared grounds. Fast Printing Green S is shown in combination

with iron, cobalt, and nickel mordants as well as chromium. Full details for preparing, printing, and finishing are included in addition to complete fastness data.

THIONOL DYES— This card contains dyeings in two depths on cotton cloth of 42 sulphur dyes. Dyeings aftertreated with copper sulphate and potassium dichromate are also included where this treatment is recommended.

TECHNICAL INFORMATION LEAFLETS— *Dyehouse No. 375. Application of Procion H Brands by Dyeing*— The application of a further seven members of the Procion H range— Brilliant Yellow H5G, Yellow HA, Brilliant Orange HGR, Scarlet H3G, Brilliant Red H7B, Rubine H2B, and Blue HB— is described. They can be applied by the pad–steam and Pad–Roll methods, but are not recommended for batchwise application to cellulosic fibres, and in general are unsuitable for the normal pad (bicarbonate)–dry technique. They are of interest for dyeing silk and nylon although on nylon they do not cover irregularly dyeing filament yarn, and their behaviour in admixture may cause trouble. Fastness data for dyeings on cellulosic fibres, silk, and nylon are given.

Dyehouse No. 378. Procion Dyes: Application to Cellulosic Fibres by a New Pad–Batch Technique— It has hitherto been considered that drying of the padded material was essential to fixation by converting the sodium bicarbonate to carbonate. It has now been found that this is not so, and dye fixation occurs when the bicarbonate–dye solution is padded on cotton and viscose rayon, even in the cold. A pad–batch process as follows— pad → batch → wash-off → dry— is therefore recommended. On viscose rayon fixation at room temperature is complete in 12–24 hr., depending on the depth of colour. If the temperature is raised to 50°C., the time is reduced to 15 min. to 6 hr. On cotton, fixation takes place more slowly, and "warm" batching is preferred. In all cases suitable mechanical arrangements must be provided to prevent drying or migration of the padding liquor on the batch during fixation. By using more alkaline padding liquors fixation may be accelerated, but this also leads to loss in dye stability in the solution and promotes the reaction between dye and water rather than between dye and fibre inside the batch.

Dyehouse No. 379. Procion Dyes: Continuous Dyeing of Woven Cellulosic Fabrics, Supplement No. 1— The addition of 15–20% of urea to the padding liquor gives a two- to four-fold increase in tinctorial value on cotton and viscose rayon at a depth of 2–6%. This is not the case with Procion Brilliant Red 2B. Procion Brilliant Blue H7G becomes applicable to cotton by this procedure, particularly if still higher concentrations of urea are used and the temperature of drying is raised.

Dyehouse No. 384. Procion and Procion "H" Dyes: General Summary of Printing Properties and Recipes— Printing properties and related data are presented in tabular form.

BEHAVIOUR OF NATURAL AND SYNTHETIC RUBBERS AT HIGH TEMPERATURES— A reprint of a lecture by G. E. Williams.

POLYURETHAN RESINS— A reprint of a lecture by W. Abbotson and R. B. Waters. (*J. Plastics Institute*, **25**, 95 (1957)).

EQUILIBRIUM ADSORPTION VALUES OF LEUCO VAT DYES ON COTTON— A reprint of a paper by R. H. Peters and H. H. Sumner (J.S.D.C., **73**, 12 (1957)).

HEXAGON DIGEST No. 25— This contains the following articles— *The Dyeing of Cellulosic Fibres with Procion Dyes* by C. D. Weston, *Colorimetry and Colour Reproduction* by T. Vickerstaff, and *A Work Integrator for Use with the Cambridge Fibre Extensometer* by M. M. Cross and G. Grimshaw.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

Tenth Annual Unit Processes Review
Ind. Eng. Chem., **49**, 1456–1576 (Part II, Sept. 1957)

Eleventh Annual Materials of Construction Review
Ind. Eng. Chem., **49**, 1577–1662 (Part II, Sept. 1957)

Feeder for Sodium Hydrosulphite
Anon.
Amer. Textile Rep., **46**, 499 (15 July 1957)

For the most efficient use of sodium hydrosulphite it should be added to the caustic soda solution at the last possible moment before padding on to cloth. This paper describes a suitable feeder and a form of hydrosulphite which flows freely even under conditions of high humidity. P.T.S.

Use of Gas Heating for Drying Cans
D. V. Vigdorchik, K. I. Gorodov, L. I. Druskin, and B. E. Cherkinskii
Gazovaya prom., (5), 17–23 (1957): *Chem. Abs.*, **51**, 13399 (10 Sept. 1957)

Design and use of gas-heated drying cans are described in detail. Scale drawings of various types of machines are given together with tables of production data. C.O.C.

PATENTS

Bleaching and Dyeing Beamed Material under Pressure
E. E. Bellmann, R. Kronsbein, and F. Bellmann
BP 782,400

A simplified form of bleaching or beam dyeing machine. C.O.C.

Maintaining Constant Tension in Yarn or Cloth during Processing
Huck Co. *BP* 779,686
BP 780,134

Maintaining Constant Tension in Material being Wound onto or off a Roller
D. Rothschild *BP* 779,691

Controlling the Tension when Winding Tubular Fabric
Samcoe Holding Corpn. *USP* 2,739,762

Controlling the Tension of Cloth, Paper, etc., while it is being drawn off a reel
E. A. Timson *BP* 783,896

Internally Heated Drums for Drying Machines or the like
W. W. Spooner *BP* 783,442

Within a drum there are several individual heating units, the drum being advantageously supported by parallel and horizontal rollers contacting its inner surface. Separate lead-on and lead-off rolls contact the outer surface of the drum and an arcuate system of heating units is located around the drum. G.S.B.

Blanket for Compressive Shrinking Machine
Albany Felt Co. *USP* 2,740,727

Marks or creases on the fabric being shrunk are avoided if the felt is impregnated with a softening and swelling agent for wool, e.g. a polyhydric alcohol of mol.wt. 65–600 and > 5% soluble in 50% aq. *iso*propyl alcohol. G.S.B.

Cropping or Raising Machines
William Whiteley & Sons *BP* 782,411

Mechanism which causes the cutters, raising rollers or the like to be removed from the cloth a predetermined time after the detector device has detected a joint in the cloth and immediately before the joint passes under the cutters.
BP 782,412

The machine incorporates a slipping clutch whose input member rotates at a speed directly related to that of the cloth rollers. When the output member is rotated it moves the cutter away from the cloth. A stop member normally prevents the output member rotating but means are provided to remove this stop whenever a joint in the cloth is detected by the detector device. This relates the

length of time the cutter is off the cloth to the speed at which the cloth is travelling and so the lengths of cloth passing under the raised cutter are kept constant.
C.O.C.

Raising Machine
A. Monfors *BP* 779,251
A construction enabling the use of ball bearings which remain in position and need not be taken out when the cylinders are removed. C.O.C.

Calender
W. P. Rose *USP* 2,739,397
The top, steel-cut gas-heated press roller is constantly driven at all times. When not in contact with the cloth it does not stop rotating because a free-wheeling over-drive arrangement enables it to be driven even when lifted. Thus no inertia is built up and so there is no uneven heating when the rollers are engaged or disengaged and so no scuff marks formed at such times. In addition if the paper roller gains speed above that of the steel roller then the latter free-wheels to enable it to be driven by the paper roller and the cloth. C.O.C.

Cleaning Device for Air-stream Doctors
Jagenberg-Werke *BP* 784,657
Modification of *BP* 743,768 (J.S.D.C., **72**, 195 (1956)) covering cleaning devices for air-stream doctors. A further device is described which enables independent compressed air streams to be supplied to both the working position and the cleaning position nozzles, thus minimising breaks in operation time. G.S.B.

Spray Booth
Svenska Luftfilter *BP* 785,498
The exhausted air conveys water as drops or droplets from the bottom of the booth to containers placed in an exhaust air duct above the overflow devices or nozzles into which the water flows by gravity from the containers. This avoids use of a pump for the water and as much larger ducts can be used the danger of clogging from the paint in the water is almost eliminated.
C.O.C.

Automatic Control in the Application of Sizing and Finishing Substances in Continuous Wet Processing (X p. 68)

II—WATER AND EFFLUENTS

Oxidation of Thiosulphate and Sulphide in Aqueous Solutions on Aeration in Presence of Pyrolusite — Treating Waste Sulphide Dye Liquors
A. M. Koganovskii, T. M. Rovinskaya, and P. N. Taran
Ukrain. khim. zhur., **23**, 257–265 (1957):
Chem. Abs., **51**, 12718 (10 Sept. 1957)
Less than 50 mg.-equiv. of $S_2O_3^{2-}$ per litre is oxidised in presence of pyrolusite at pH 4–5·8 by air in 30–50 min. to SO_4^{2-} and polythionates. In alkaline solution, oxidation is very slow, but as the polythionates are decomposed by OH^- to $S_2O_3^{2-}$ and SO_3^{2-}, repeated addition of NaOH (0·025 mol./litre) to the product and re-oxidation reduces the thiosulphate–polythionate total stepwise to satisfactory levels. SO_3^{2-} and S^{2-} are rapidly oxidised by MnO_2. A mixture of S^{2-}, SO_3^{2-}, and $S_2O_3^{2-}$ is more rapidly oxidised than are the components. The method holds promise for treating waste sulphide dye liquors.
C.O.C.

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

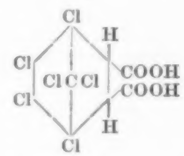
Application of Fatty Acids in Textile Industries
A. Parisot
Teintex, **22**, 589–608 (Aug. 1957)
Fatty acids are used in detergents, sizes, textile finishes such as softening and waterproofing agents, and in the synthesis of textile fibres. Of these, sizes consume by far the greatest weight. The tendency towards using crude products is coming to an end. S.R.C.

PATENTS

Stable Acid Emulsion by use of Anionic Surface-active Agents
Newton Chambers & Co. *BP* 778,904
Aromatic, halogenated aliphatic or halogenated aromatic hydrocarbons yield stable emulsions in aqueous mineral acid if a compound of formula RSO_3H or RSO_4H (R = Alk or Ar) is used as the emulsifying agent. C.O.C.

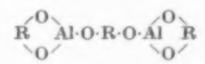
Polymerisable and Co-polymerisable Amide-like Compounds
Ciba *BP* 779,231
Polymerisable products are obtained by treating a methylol compound of the amino-1:3:5-triazine or urea group or an ether of such compound with an aliphatic alcohol of < 5 C, with a nitrile of an unsaturated polymerisable acid in presence of an acid condensing agent. The products can be used as resin finishes for textiles.
BP 779,232
The nitrile can be replaced by an amide of such an acid containing H attached to the amido N and a compound containing at least one active H atom bound to a hetero atom capable of combining additively at the double bonds of unsaturated compounds. The proportions of the components are such that the product contains at least one unsaturated residue derived from the nitrile or amide. C.O.C.

Chlorendic Acid as Dispersing Agent in Preparing Aqueous Dispersions of Polyfluoroethylenes
DuP *BP* 783,742
Aqueous dispersions of polyfluoroethylenes formed by polymerising fluoroethylenes in water in presence of chlorendic acid



are very stable and can be used *inter alia* for impregnating textiles. C.O.C.

Soluble Aluminium Glycolates—Water-repellent Agents
FH *BP* 783,605
Products of probable formula—



are obtained by heating aluminium alcoholates of aliphatic monohydric alcohols of < 7 C with aliphatic glycols of 4–18 C which, unless the C chain is interrupted by O atoms, must contain at least one secondary hydroxyl group. If desired they may be further heated with $\not>$ 2 mol. of a carboxylic and/or sulphuric acid for each g.-atom of Al. They are used from inert organic solvents as water-repellent agents for textiles. C.O.C.

Stable Dispersions of Vinylidene–Vinyl Copolymers
CFM *BP* 780,700
Stable dispersions of fine particle size are obtained by polymerising vinylidene chloride (70–85%), vinyl acetate (25–10%) and another vinyl compound (0–20%) in aqueous dispersion in presence of both a reducing and an oxidising agent. They are used as textile, paper and leather finishes and as binding agents for pigments. C.O.C.

Driers
Carlisle Chemical Works *USP* 2,739,902
Although zirconium soaps cannot be used as driers yet it is possible to replace much of the primary driers by Zr, e.g. up to 60% of cobalt or 80% of manganese can be replaced by zirconium without impairing the drying properties of the composition. In addition secondary driers, e.g. Pb can be completely replaced by Zr while maintaining the same drying time and much improving the water-resistance of the coatings. The amount of zirconium needed is only 10–50% of that of lead.
C.O.C.

2-Ethylhexoic Acid Derivatives of Zirconylic Acid as Driers
Carlisle Chemical Works *USP* 2,739,905
2-Ethylhexoic acid derivatives of zirconylic acid, e.g. compounds of empirical formula—

$$C_4H_9CH(C_2H_5)COO{-}(ZrO{-}O{-})n{-}OC(C_2H_5)HCC_4H_9$$

(*n* = a fractional number between 1 and 2) have excellent

drying properties and can replace to a considerable extent conventional Mn, Co and Pb driers. They can be used in relatively large quantities in white paints without producing discoloration. C.O.C.

Polymers of 3:3-bis(Chloromethyl)oxetane as Coating Agents
Hercules Powder Co. *BP* 783,552
Polymers of 3:3-bis(chloromethyl)oxetane of mol.wt. $\nless$ 10,000 are applied to metals, textiles, paper, etc., and then fused by heating to above the softening point of the polymer. The resulting coatings have strong adherence, high chemical resistance, are not attacked by most solvents and are impervious to water and air. C.O.C.

Thermosetting Coating Compositions Curable at Room Temperature
Fenolic International *BP* 782,393
A mixture of a thermosetting resin (10–40%), an alkyd resin (40–80), a thermoplastic resin (0·5–6·0) and an acid catalyst for the thermosetting resin is used for coating cellulosic textiles, paper, etc. C.O.C.

Laundry Bleach
Olin Mathieson Chemical Corpn. *BP* 780,812
A bleach for commercial laundries consists of a high-test calcium hypochlorite containing 2–10% by weight of sodium tripolyphosphate. Such a bleach can be used in presence of soap, e.g. in the usual washing liquor, without any flocculation occurring. C.O.C.

Improved Saponaceous Detergents
Gy *BP* 785,644
Alkylolamine salts of ethylenediamine tetraacetic acid are much more compatible with common soap than are the alkali metal salts. Addition to soap of about 20% of a mixture of such an alkylolamine salt ($\nless$ 1 part by wt.) with an alkali metal salt of ethylenediamine tetraacetic acid (3) yields a detergent of particular value for removing heavy metals, especially radioactive materials, from the skin, solid surfaces, textiles, etc. C.O.C.

Polyalkylene Oxide— Polybasic Carboxylic Acid Condensates
Boehme Fettchemie *BP* 785,474
Condensing polyalkylene oxides containing a lipophilic group and at least one free OH group and of mol. wt. $\nless$ 1000 with polybasic carboxylic acids containing $>$ 2 COOH groups and at least one lipophilic group yields, according to the choice of starting materials, products which are either hydrophilic or lipophilic and which can be obtained in both water-soluble and water-insoluble forms. They have many uses as auxiliary agents for textiles or leather, as vehicles for colour pastes, as impregnating agents for paper, wood, etc. C.O.C.

Feeder for Sodium Hydrosulphite (I p. 48)

Dyeing Assistant for Chrome-complex Dyes. I— Application of Polyoxyethylene Alkyl Ethers (VIII p. 65)

Gas-fume Fading Inhibitors (VIII p. 66)

IV— RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

World Consumption of Colouring Matters
I. Priskic
Teintex, 22, 581–589 (Aug. 1957)
The available statistics are assembled into four classes— (*a*) Countries which are only slightly industrialised (Mexico, Indonesia, Egypt, Iran, Burma, South Africa, Indochina, Siam, India, Brazil, Pakistan, Peru, and China) consume annually 0–5 g. per head. Approx. 62% of the world's population is at this level. (*b*) Countries in process of industrialisation (Spain, Yugoslavia, Portugal, Turkey, Argentina, Colombia, Chile, Venezuela, and Uruguay), 35–100 g. per capita per annum. (*c*) Countries of advanced industrialisation (Canada, Austria, Australia, Denmark, Finland, and Norway), 100–200 g. per capita per annum. (*d*) Highly developed countries (France, Japan, Belgium, the U.S.A., West Germany, the United Kingdom, Italy, Holland, Switzerland, Sweden, Czechoslovakia, Poland, East Germany, and the U.S.S.R.), $>$ 200 g. per capita per annum. S.R.C.

Boron Trifluoride-Nitrous Anhydride (BF_3–N_2O_3) Complex— Its Use in Diazotisation and Nitration
G. B. Bachman and T. Hokama
J. Amer. Chem. Soc., 79, 4370–4373 (20 Aug. 1957)
Boron trifluoride forms a stable white, solid complex BF_3,N_2O_3 with nitrogen trioxide. Its physical and chemical properties suggest that its structure is best represented as $(F_3B \leftarrow NO_2)^-(NO)^+$. It is a weak nitrating agent but a powerful diazotising agent in the aromatic series. C.O.C.

Reactions of Diazoamino Compounds. I— Thermal Decomposition of Diazoaminobenzoic Acids
A. I. Kizber and V. A. Puchkov
J. Gen. Chem. U.S.S.R., 27, 2208–2213 (Aug. 1957)

Electrochemical Studies of Dye-forming Coupling
B. Vlcek
Z. wiss. Phot., 51, 175–185 (1956): *Chem. Abs.*, 51, 11898 (25 Aug. 1957)
A polarographic method in which by automatic reversal of the electrode (Pt or Hg) the oxidation product of *NN*-diethyl-*p*-phenylenediamine (I) is first formed and then reduced. The reactivity of a colour coupler is determined from the decrease in the reduction current produced by adding the coupler. The reactivities of 18 couplers in 95% alcohol buffered by 0·2 M-Li acetate + 0·2 M-acetic acid are given. The different reactivities of the semiquinone and diimine of I can be determined in the alcoholic solution. The reactivity of the diimine in aqueous solution buffered at pH 9·2 with borax increases with couplers in the order given: ethyl acetoacetate, *p*-nitrophenylacetonitrile, *o*-chloroacetoacetanilide, 2:4-dichloro-1-naphthol, 1-naphthol. The large increase in reactivity of 1-naphthol between acid and alkaline solution is caused by its ionisation (pK = 8). C.O.C.

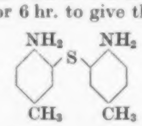
Mechanism of Dye Formation in Colour Photography
L. K. J. Tong and M. C. Glesmann

V— Effect of a Non-ionic Surfactant on the Ionisation of Couplers
J. Amer. Chem. Soc., 79, 4305–4310 (20 Aug. 1957)

VI— Effect of a Non-ionic Surfactant on the Rate of Coupling
Ibid., 4310–4313

Azo Dyes

VIII— Azo Dyes of Thio- and Dithio-amino Derivatives
K. Harada and K. Murata
Hiroshima Daigaku Kogakubu Kenkyu Hokuku, 5, 187–193 (1956): *Chem. Abs.*, 51, 10909 (25 July 1957)
p-Toluidine mixed with S was heated to 140°c., PbO added and stirred for 6 hr. to give thiodi-*p*-toluidine—



This was tetrazotised and coupled with various coupling components to give disazo dyes. A similar series of dyes was prepared from tetrazotised 4:4′-diamino-2:2′-dinitrodiphenyl disulphide.

IX— Azo Dyes of *N*-(4-Aminobenzoyl)-*p*-phenylenediamine
K. Murata, K. Harada, and H. Kuwata
Ibid., 311–314: *Chem. Abs.*, 51, 10909 (25 July 1957)
p-Nitroaniline was condensed with *p*-nitrobenzoyl chloride and the product reduced with Fe and acetic acid to give the diamine. This was tetrazotised and coupled with various coupling components to give direct dyes; sulphanilic acid for example, gave a yellow.

X— Azo Dyes of 3-Amino-4:4′-bisdimethylaminobenzophenone
K. Murata, K. Harada, and H. Mitoguchi
Ibid., 315–318: *Chem. Abs.*, 51, 10910 (25 July 1957)
4:4′-Bisdimethylaminobenzophenone was nitrated and reduced to give the 3-amino compound, which was diazotised and coupled with various coupling components. Schaeffer acid for instance gives a pink dye for silk. E.S.

Aromatic Diazo and Azo Compounds
XXIII—New Syntheses and Reactions of Triazolobenzenes
F. Muzik

Chem. Listy, **51**, 515–528 (1957): *Chem. Abs.*, **51**, 10506 (25 July 1957)

Reduction of *N-p*-toluenesulphonyl-2:4-dinitroaniline gives the corresponding 2:4-diamino compound which couples in the 5 position with diazotised aniline or sulphanilic acid. Oxidation of the monoazo compounds so formed with air in presence of $CuSO_4$ and pyridine gives benzotriazole derivatives. These may be coupled with diazo compounds, giving azo compounds which may in turn be oxidised to bistriazoles.

XXIV—Oxidation of Azo Dyes to Diazo Compounds
J. Poskocil and Z. Allan

Ibid., 529–532: *Chem. Abs.*, **51**, 10507 (25 July 1957)

Azo compounds prepared by coupling 1:2:5-, 1:2:6-, 2:1:4-, and 2:1:5-diazonaphtholsulphonic acids with resorcinol undergo cleavage when oxidised at 20°c. with air in dil. aq. NaOH, yielding the original starting compounds. E.S.

Studies of Metallated Dye Complexes. III—Copper (II)-o-Azophenol Complexes
H. B. Jonassen and E. J. Gonzales

J. Amer. Chem. Soc., **79**, 4282–4284 (20 Aug. 1957)

Spectrophotometric and conductometric evidence indicates that the copper (II)-*o*-azophenol complex forms a copper (II) complex with propylene glycol in alkali in which the glycol and copper (II)-dye react in 1:1 mole ratio. C.O.C.

Photoreduction of Methylene Blue (C.I. Basic Blue 9) by Ethylenediaminetetraacetic Acid
G. Oster and N. Wotherspoon

J. Amer. Chem. Soc., **79**, 4836–4838 (20 Sept. 1957)

C.I. Basic Blue 9 in presence of ethylenediaminetetraacetic acid (I) is reduced to the leuco dye on irradiation by red light. The rate of photoreduction depends upon pH in the same way as does the base titration of I. I is consumed in the reaction suggesting that it is oxidised although it does not normally behave as a reducing agent. Out of several nitrogenous chelating agents tested only those with secondary or tertiary N atoms behaved as electron donors in the photochemical reaction. The photoreduction involves a long-lived excited state of the dye (10^5 times that of the first electronically excited state) and is retarded by small amounts of *p*-phenylenediamine. The rate of regeneration of the dye by near ultraviolet irradiation of the leuco compound increases with increasing hydrogen ion concentration. C.O.C.

Hydride Transfer to Carbonium Ions. I—The Mechanism of the Reduction of the Triphenylmethylcarbonium Ion in Formic Acid
R. Stewart

Canadian J. Chem., **35**, 766–777 (Aug. 1957)

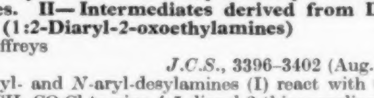
Oxazole Cyanine and *mero*Cyanine Dyes and Intermediates. II—Intermediates derived from Desylamines (1:2-Diaryl-2-oxoethylamines)
R. A. Jeffreys

J.C.S., 3396–3402 (Aug. 1957)

N-Alkyl- and *N*-aryl-desylamines (I) react with $CSCl_2$, CS_2, or $CH_3{\cdot}CO{\cdot}Cl$ to give 4:5-diaryl-2-thiooxazolines (II), 4:5-diaryl-2-thiothiazolines (III), and 4:5-diaryl-2-methyloxazolium salts (IV) respectively. These intermediates are then used in the syntheses of mono- and tri-methincyanine dyes and *mero*cyanine dyes derived from oxazole and thiazole. 26 Examples of dyes are given, many of which possess short resonance paths and in consequence are fluorescent and almost colourless.

$$\begin{array}{c} R^2CO \\ | \\ R^1CH{\cdot}NHR \end{array}$$

(I; R = C_2H_5, R^1 = *p*-$CH_3O{\cdot}C_6H_4$ or C_6H_5, R^2 = C_6H_5 or *p*-$CH_3O{\cdot}C_6H_4$).



(II) (III) (IV) H.H.H.

Electronic Spectra of Pyridocyanine Dyes with Assignments of Transitions
G. S. Levinson, W. T. Simpson, and W. Curtis

J. Amer. Chem. Soc., **79**, 4314–4320 (20 Aug. 1957)

The electronic spectra of 2:2'- and 4:4'-pyridocyanine dyes have absorptions at ca. 490, 360 and 260 mμ. which are assigned, respectively, as long axis, short axis and (probably) long axis polarised. The dye 1:1'-diethyl-2:2'-pyridocyanine iodide exists as the unsymmetrical isomer and at low temperatures aggregates into an ion pair and a dimer of ion pairs. The dimer has a triplet-singlet emission with peaks at 600 and 650 mμ. C.O.C.

Sulphuric Esters of Polycyclic Quinols
W. Bradley and J. G. Lee

J.C.S., 3549–3554 (Aug. 1957)

Salts of the disulphuric esters of quinol, anthraquinol, 6:12-dihydroxyanthanthrene, and 3:8-dihydroxy-1:2-6:7-dibenzopyrene are now described and studied. None undergoes replacement of the groups $-O{\cdot}SO_3^-$, with the nucleophilic agents employed (aniline, KCN, $C_2H_5{\cdot}ONa$), but all are readily hydrolysed by acids and oxidised to the related quinones with acid oxidants. H.H.H.

Planarity of Quinonoid Dyes and their Substantivity for Cellulose and Cellulose Acetate
B. D. Tilak and S. S. Rao

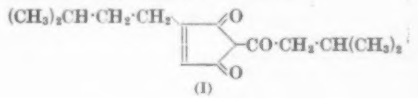
Chem. and Ind., 1320 (5 Oct. 1957)

Interaction of *endo*-9:10-*o*-phenylene-2:3-dichloro-9:10-dihydro-1:4-anthraquinone with naphthols, amines, and compounds containing a reactive methylene group, in the presence of pyridine, leads to a series of complex non-planar quinonoid dyes. Six examples are given, all of which (as yellow to orange-yellow alkaline-hydrosulphite vats) have no substantivity for cotton or (as fine dispersions) for cellulose acetate. On the other hand, corresponding planar vat dyes from 2:3-dichloro-1:4-naphthaquinone and from chloranil are substantive. These findings confirm the view that substantive vat dyes must be planar in structure. H.H.H.

β-Triketones. IV—Chromophore of Calythrone
A. J. Birch and R. J. English

J.C.S., 3805–3806 (Aug. 1957)

The synthesis of 4-3'-methylbutyl-2-*iso*valeroyl*cyclo*pent-4-ene-1:3-dione (I) from dihydrohumulinic (III) acid is described, in order to provide a model containing the chromophore of structure (II), which had previously (*J.C.S.*, 3026 (1951)) been assigned to calythrone. It is notable that III is sol. in bicarbonate soln., whereas I is sol. only in carbonate soln., to give a yellow salt. I gives a deep brownish-red colour with alcoholic $FeCl_3$ and, when refluxed with cupric acetate in methanol, affords the copper salt as a greenish-yellow solid.



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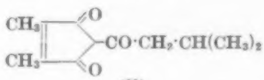


(II)

H.H.H.

Red Shifts in the Spectra of Anthracene Derivatives
S. R. Veljkovic

Trans. Faraday Soc., **53**, 1181–1185 (Sept. 1957)

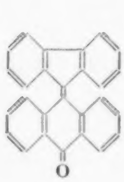
Dispersion forces are shown to be the main reason for the dependence of the fluorescence red shifts in anthracene on the properties of the solvents. The presence of a highly polar group in an anthracene derivative enhances dipole–dipole interaction. W.R.M.

Photodehydrogenation and Photo-oxidation of Some Thermochromic Ethylenes and Related Compounds
A. F. A. Ismail and Z. M. El-Shafei

J.C.S., 3393–3396 (Aug. 1957)

Thermochromism and piezochromism exhibited by certain polynuclear ethylenes, e.g. dianthraquinone and dixanthylidene, have been attributed to diradical formation or internal betaine structure. A new thermochromic ethylene, 9:9'-fluorenylideneanthrone (I), a yellowish-brown solid (violet melt) which gives deep violet solutions exhibiting thermochromism, is now reported. When

pressed, the crystals change to deep violet (piezochromism). I suffers photo-oxidation in presence of oxygen with cleavage to anthraquinone and fluorenone, which fact seems to favour the existence of a diradical whose formation is enhanced by irradiation; it is not affected by sunlight in a CO_2 atmosphere. Acceleration of oxygen absorption with time indicates that I is producing a fresh chain-starting catalyst and forming a peroxide whose presence was revealed by the peculiar reversible colour change noticed in the early stages of the photo-oxidation; the latter reaction is somewhat similar to the oxidation of bisdiphenylene-ethylene and the photo-oxidation of polystyrene peroxide. Mechanism via the peroxide is thus favoured. On the other hand, the related cpd. (II) and a deriv. (III) are photodehydrogenated in presence of O_2 or CO_2 with formation of highly condensed ring systems (benzo[*a,o*]perylenes).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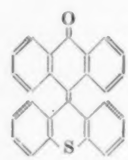
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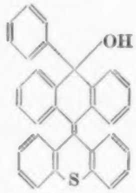

(III)

H.H.H.

Anthraquinone Vat Dyes

A. Tundo

IV— Sulphonated Acylaminoanthraquinones from 2:5-Furandicarboxylic Acids and Terephthalic Acids

Ann. Chim. (Rome), **47**, 285–290 (1957)

Vat dyes fast to light and alkali are produced by refluxing 1-amino-2-bromo-4-arylaminoanthraquinones or 1-amino-2-bromo-4-benzenesulphonamidoanthraquinones in chlorobenzene with 2:5-furandicarbonyl chloride or terephthaloylchloride. Methods for separating the products are described and m.p. given.

V— Reaction Between 1-Amino-2:4-dibromoanthraquinones and Arylamines

Ibid., 291–298:
Chem. Abs., **51**, 10914 (25 July 1957)

The green by-products of this reaction are considered to be 4:4′-bis(arylamino)indanthrones formed by the condensation of 2 mol. 1-amino-2-bromo-4-arylaminoanthraquinone. Quantitative yields of these indanthrones result from using nitrobenzene as the solvent and a Cu catalyst. They dye nylon, cotton or rayon green to greenish-blue and treatment with 100% H_2SO_4 and boric acid yields fast, water-soluble, wool dyes. E.T.

Dyes of the Anthraquinone Series. VI— Hydroxydianilinoanthraquinone Series

K. Murata, K. Harada, and H. Kuwata

Hiroshima Daigaku Kogokubu Kenkyu Hokoku, **5**, 319–335 (1956):
Chem. Abs., **51**, 10910 (25 July 1957)

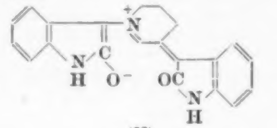
1:4-Dihydroxyanthraquinone (quinizarin) is brominated to give the 2-bromo-derivative. Then, condensed with aniline under varying conditions to yield 2-anilinoquinizarinquinone or 2-anilinoquinizarin. The latter, condensed further with aniline and boric acid, gives 1:2-dianilino-4-hydroxyanthraquinone. This product may also be obtained starting from 1:2-dihydroxyanthraquinone (alizarin) via hydroxylation with MnO_2 and H_2SO_4 followed by condensation with aniline. Other hydroxyanilino- and hydroxydianilinoanthraquinones are made via 4-nitro-alizarin. The various by-products of the above reactions are detailed and the m.p. of all products and several of their acetyl-derivatives are given. E.T.

Structure of Isatin Blue

A. W. Johnson and D. J. McCaldin

J.C.S., 3470–3477 (Aug. 1957)

Pipecolic acid in aq. soln. and piperidine in acetic anhydride both condense with isatin to give the so called isatin blue (I), which is closely related to the product from the reaction of proline and isatin. I is noteworthy for the variety of structural formulae proposed for it since its discovery by Schotten (cf. *Ber. deutsch. chem. Ges.*, **24**, 1366, 2604 (1891)), all of which are now shown to be incorrect. Reasons, based on chemical and spectroscopic evidence, are now given for a resonance hybrid of structures II and III for the structure of isatin blue. Related compounds derived by condensation of isatin with either cyclic secondary bases or cyclic α-iminocarboxylic acids are also discussed.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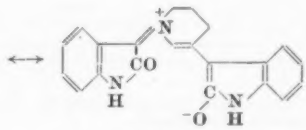
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H.H.H.

Phthalocyanine Derivatives

N. Fukada

I— Copper 4:4′:4″:4‴-Phthalocyaninetetrasulphonic Acid Derivatives

Nippon Kagaku Zasshi, **75**, 378–380 (1954)

II— Salts of Copper 4:4′:4″:4‴-Phthalocyaninetetrasulphonic Acid

Ibid., 380–383

III— Nickel 4:4′:4″:4‴-Phthalocyaninetetrasulphonates

Ibid., 586–588:
Chem. Abs., **51**, 11153–11154 (10 Aug. 1957)

I— Triammonium-4-sulphophthalate was prepared by double decomposition of Ba 4-sulphophthalate with $(NH_4)_2CO_3$. On heating it with Cu powder, urea and water at 210°c., a dark blue syrupy mass was formed. Adding NH_4Cl to a HCl solution of this syrupy mass precipitated blue triammonium monohydrogen Cu 4:4′:4″:4‴-phthalocyaninetetrasulphonate. It was purified by salting with NH_4Cl from N-HCl solution and removing the ammonium salt by sublimation. Copper compounds can replace the Cu powder, Cu bromide, iodide, sulphide and acetate yielding bright coloured compounds. Boric acid and ammonium molybdate accelerate the reaction and increase the yield by 35–40%.

II— NH_4, alkali, Mg and Ag salts are soluble; Pb and alkaline earth salts are insoluble. The free sulphonic acid could not be isolated. Normal salt and acid salt of type $(C_8H_3N_2SO_3Na)_4Cu$ and $(C_8H_3N_2SO_3Na)_3Cu(C_8H_3N_2SO_3H)$ were obtained. In the cases of Pb and alkaline earth metals, two sulphonic acid radicals in the same molecule cannot combine with metals because of steric restrictions and metals are presumed to unite adjacent phthalocyanin molecules. These salts form long stringy precipitates.

III— Nickel 4:4′:4″:4‴-phthalocyaninetetrasulphonic acid was prepared from triammoniumsulphophthalate, urea, boric acid water and Ni in the same way as the corresponding Cu compound. Ammonium, alkali, Ag, Mg, alkaline earth and Pb salts are described. Ni compounds are less soluble than the corresponding Cu compounds. C.O.C.

Absorption Spectra and Fluorescence Properties of Concentrated Solutions of Organic Dyes

T. Förstner and E. König

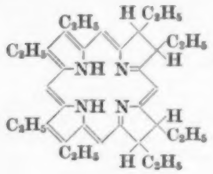
Z. Elektrochem., **61**, 344–348 (1957):
Chem. Abs., **51**, 11066 (10 Aug. 1957)

Examination of the concentration dependence of the absorption spectra of aqueous solutions of C.I. Acid Yellow 73, C.I. Acid Red 87 and C.I. Basic Violet 10 indicates that the dyes exist in the solution as dimers. The monomer absorption bonds, upon dimerisation, split into two bands, one at slightly longer, the other at appreciably shorter wavelengths. C.O.C.

Novel Hydroporphyrins
U. Eisner

J.C.S., 3461–3469 (Aug. 1957)

Reduction of the iron complex of octaethylporphin with Na in boiling *iso*pentyl alcohol afforded a complex mixture of pigments, which were separated by chromatography on magnesium oxide. The bands in order of elution were — a yellow band containing traces of *b*-octaethyltetrahydroporphin (II), a pink band of *a*-octaethyltetrahydroporphin (I), a green band of octaethylchlorin (III), and a red band of unchanged initial material. Reduction of III afforded, in addition to the tetrahydro deriv., the octaethylhexa- and an octaethylocta-hydroporphin. Light-absorption properties are discussed, and quant. stepwise dehydrogenation of the hydro pigments is described.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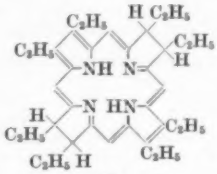
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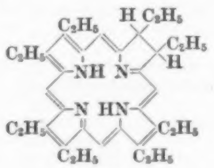

(III)

H.H.H.

Carotenoid Syntheses

X—Application of the Wittig Reaction to the Synthesis of Esters of Bixin and of Crocetin
O. Isler, H. Gutmann, M. Montavon, R. Rüegg, G. Ryser, and P. Zeller

Helv. chim. Acta, **40**, 1242–1249 (Aug. 1957)

XI—αβ-Unsaturated Carbonyl Compounds from Allyl Halides and Nitroparaffins
M. Montavon, H. Lindlar, R. Marbet, R. Rüegg, G. Ryser, G. Saucy, P. Zeller, and O. Isler

Ibid., 1250–1256

XII—Synthesis of 11:11′-Di-*cis*-β-carotene by a New Method
O. Isler, L. H. Chopard-dit-Jean, M. Montavon, R. Rüegg, and P. Zeller

Ibid., 1256–1262

Structure of Melanins
D. Kertesz

Pubbl. staz. zool. Napoli, **29**, 33–40 (1957): *Chem. Abs.*, **51**, 11409 (10 Aug. 1957)

Dihydroxyphenyalanine, tyrosine and tyramine were each oxidised quantitatively *in vitro* into melanins by polyphenol oxidase. The highly purified enzyme, although necessarily used in very great excess, did not surpass 4·7% of the weight of the substrate. The stoichiometric equations obeyed in the melanogenesis are given. The empirical composition of the melanin produced from tyramine is $C_8H_5NO_2$ and thus agrees with that for melanin obtained from tyrosine or dihydroxyphenylalanine by previous workers. C.O.C.

Preparation of Paris Blue (C.I. Pigment Blue 27)
K. Polinszky, V. Ochsenfeld, J. De Jonge, and G. Szigeti

Chem. Zvesti, **11**, 98–106 (1957): *Chem. Abs.*, **51**, 12503 (25 Aug. 1957)

The formation of the white mass (I) which is the first step in making Paris Blue and its effect on the quality of the pigment were studied. I is $K_2Fe[Fe(CN)_6]$; it adsorbs $FeSO_4$ and the amount of $FeSO_4$ in solution is increased in proportion to the amount of $FeSO_4$ used for precipitation. The amount of $FeSO_4$ adsorbed in I is dependent on the concentration of the initial solutions and follows the known laws of adsorption. The strength of the solutions, the speed and the order of added components affect the quality to a less degree while the temperature of precipitation and the molecular ratio $FeSO_4$:$K_4[Fe(CN)_6]$ have a much greater effect. By boiling I in aq. H_2SO_4 for a long time, $FeSO_4$ is desorbed and a precipitate of the derived $K_2Fe[Fe(CN)_6]$ composition is obtained. The quality of the pigment is improved by increasing the amount of K. C.O.C.

Calcium Plumbate
N. J. Read

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 751–759, 775–779 (Aug. 1957)

Zinc Tetroxychromate in Priming Paints
D. S. Newton

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 767–770, 775–779 (Aug. 1957)

Zinc Dust in Anti-corrosive Paints
D. S. Newton

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 770–775, 775–779 (Aug. 1957)

Metallic Lead Pigment
J. R. Surridge

Off. Dig. Fed. Paint Varn. Prod. Cl., **29**, 759–767, 775–779 (Aug. 1957)

Chinese Green—Lo-Kao
S. M. Edelstein

Amer. Dyestuff Rep., **46**, 433–436 (17 June 1957)

Historical. C.J.W.H.

Steric Effects on Mesomerism
B. M. Wepster

XV—Ultraviolet Absorption Spectra, Molecular Refractions, Basic Strengths, and Rates of Reaction of Derivatives of Nitrobenzene

Rec. Trav. chim., **76**, 335–356 (April 1957)

The effect of steric hindrance caused by *ortho* alkyl groups on the mesomeric interaction of the nitro group with an aromatic nucleus has been investigated by studying the physical properties of substituted nitrobenzenes, *p*-nitroanilines, and *p*-nitroacetanilides. Linear relations between the molecular extinction coefficients of the *K* bands and the molar refractions, the basic strengths, and the deacylation rate constants of the compounds investigated have been discovered. A value of 2·3 kcal./mole is given for the "extra mesomeric energy" in *p*-nitroaniline due to interaction of the two substituents.

XVI—Ultraviolet Absorption Spectra, Molecular Refractions, Rates of Reaction, and Basic Strengths of Aromatic Amines

Ibid., 357–389

From a study of the physical properties of *o*-alkylanilines it is concluded that these compounds are free from any appreciable steric inhibition of mesomeric interaction between the amine group and the aromatic nucleus. The relatively low basic strengths of the *o*-alkylanilines in water and aqueous alcohol are ascribed to steric hindrance to solvation. In the case of the *ortho*-substituted dimethylanilines steric inhibition to resonance does occur, and linear relationships between the properties investigated, similar to those found in the case of the nitro compounds, are established. The anomalies in the basic strengths of the *o*-alkyldimethylanilines are interpreted as being at least mainly due to steric hindrance to solvation (cf. H. C. Brown and A. Cahn, *J. Amer. Chem. Soc.*, **72**, 2939 (1950)). J.E.B.

***p*-Aminosalicylic Acid by Reduction of *p*-Nitrosalicylic Acid**
L. A. Mikhaĭlova, L. S. Solodor', E. A. Ovchinnikova, G. V. Kozÿreva, S. T. Samurova, and L. N. Efremova

J. Appl. Chem. U.S.S.R., **30**, 623–629 (April 1957)

An 80–85% yield of *p*-aminosalicylic acid can be obtained when the ammonium salt of *p*-nitrosalicylic acid is reduced with Raney nickel at pH 5·5–5·8 and 45–50°c. When the reduction is carried out above pH 5·9, a nickel complex precipitates, which contaminates the final product. T.Z.W.

Colourless and Yellow Forms of *N*-Hydroxyphthalimide
W. R. Roderick and W. G. Brown

J. Amer. Chem. Soc., **79**, 5196–5198 (5 Oct. 1957)

The colourless and yellow forms of the compound known as "phthaloxime" have identical infrared spectra. This is true also of the colourless and coloured derivatives

obtained for the two forms respectively. Evidence is given which shows that the characteristic colour and fluorescence of the yellow form are due to a trace impurity.
C.O.C.

Synthesis of 3-Nitro-2-naphthol
D. Woodcock and D. R. Clifford
J.C.S., 4139–4141 (Sept. 1957)

The obvious preparative routes, such as diazotisation of 3-nitro-2-naphthylamine and its subsequent decomp., replacement of the diazonium group of diazotised 3-methoxy-2-naphthylamine by a nitro group or its oxidation with peroxytrifluoroacetic acid to the corresponding nitro cpd., all failed. A more circuitous route had to be followed: 2-naphthol is first reduced to 5:6:7:8-tetrahydro-2-naphthol, which is nitrated with liquid N_2O_4 to the 3-nitro deriv., and the latter dehydrogenated to 3-nitro-2-naphthol. H.H.H.

Reactions of Bisamides. X—Condensations of *NN'*-Arylmethylenebisamides with Phenols and Naphthols
Gj. Stefanovic, J. Bojanovic, V. Vandjel, Z. Maksimovic, and M. Lj. Mihailovic
Rec. Trav. chim., 76, 249–260 (March 1957)

NN'-Arylmethylenebisamides react with phenols to give α-acylaminobenzylcresols. The substitution normally takes places *ortho* to the phenolic hydroxyl group. When this position is occupied, *para* substitution takes place. β-Naphthol reacts in a similar manner to phenols, but with α-naphthol both amide residues are removed to give a triphenylmethane type of molecule, 4:4'-benzylidenebis-α-naphthol. J.E.B.

Direct Introduction of the Diazonium Group into Aromatic Nuclei

I—Basic Reaction, yielding Diazonium Salts from Polyalkylbenzenes, Phenol Ethers, Phenols, and Aromatic Tertiary Amines
J. M. Tedder
J.C.S., 4003–4008 (Sept. 1957)

Conversion of an aromatic hydrocarbon into a diazonium salt usually involves the three stages of nitration, reduction to the amine, and diazotisation. A general reaction for bringing about this conversion in one step is now demonstrated, and depends on the direct action of excess nitrous acid or of a nitrosyl deriv. on the hydrocarbon—

$$\mathrm{ArH} + 2\mathrm{HNO_2} + \mathrm{HX} \rightarrow \mathrm{Ar{\cdot}N_2^+X^-} + 2\mathrm{H_2O} + 2[\mathrm{O}]$$

With aromatic cpd. containing activating groups, the yields are sufficient to give the reaction preparative value, e.g. from *p*-cresol (56%) and from phenol (80%). Success or failure with less reactive cpd. depends to a large extent on the initial nitrosation reaction. Concurrent sulphonation and nitration are almost completely avoided by the use of nitrosylsulphuric acid in nitrobenzene and in an inert atmosphere (e.g. CO_2).

II—Diazonium Salts from Aromatic Sulphonic Acids, Carboxylic Acids, and Nitro Compounds prepared by use of Mercuric Ions as Catalyst
J. M. Tedder and G. Theaker
Ibid., 4008–4012

The method of Part I is extended to deal with deactivated aromatic nuclei. For this purpose, the cpd., dissolved in conc. H_2SO_4, is treated with nitrosylsulphuric acid and a catalytic amount of mercuric sulphate. Moderate yields of diazonium salts have thereby been prepared from aromatic sulphonic acids, carboxylic acids, and nitro cpd. H.H.H.

Theory of Absorption Spectra of Symmetrical Cyanine Dyes and Polyenes
S. Olszewski
J. Chem. Phys., 26, 1020–1022 (1957):
Chem. Abs., 51, 13570 (25 Sept. 1957)

The AS FEMO (antisymmetrised free-electron molecular-orbital) method was applied to calculate the absorption maximum in the spectrum of symmetrical cyanine dyes and polyenes. Improvement of the theoretical λ_{max} values for cyanines can be obtained by introducing the resonance barrier in the FE model. The height of the barrier is determined by the stabilisation energies of the cyanine nuclei. C.O.C.

Influence of Halogens in the *meso* Position on the Shift of the Absorption Maximum in Pentamethin Cyanine Dyes
Z. Jezewski, A. Szuchnik, and J. Swiderski
Roczniki Chem., 30, 467–474 (1956):
Chem. Abs., 51, 13570 (25 Sept. 1957)

Substitution of Cl in a *meso* position of indoline shifted the absorption maximum 50 A. toward the direction of longer wavelength, whereas the same substitution in benzothiazoline dyes caused no shift. Substitution of Br caused greater shift (80–100 A.) toward the longer wavelength than did Cl in the case of indoline dyes, but with benzothiazoline dyes caused a 50-A. shift toward shorter wavelength. The results in the case of indoline dyes are attributed to shifts from greater resonance possibilities in the excited states in the halogen-substituted materials. The reverse effect in the case of benzothiazoline dyes may be related to a shift of electrons from the S toward the N atoms in the molecule. C.O.C.

Constitution and Colour of the Formazans
H. Ziegler
Ind. chim. belge, 22, 533–542 (1957):
Chem. Abs., 51, 13796 (25 Sept. 1957)

The colour of the formazans is determined by the central azo–hydrazonic ring, which has a mesomeric and alternatively polarised character. The influence of the substituents bound to the *meso*-C and to the two negatively polarised N atoms and the influence of complex formation with metals on the colour are discussed.
C.O.C.

Phthalocyanine Derivatives. IV—Salts of Cobalt 4:4':4'':4'''-Phthalocyaninetetrasulphonic Acid
N. Fukada
Nippon Kagaku Zasshi, 75, 1141–1143 (1954):
Chem. Abs., 51, 12729 (10 Sept. 1957)

Co 4:4':4'':4'''-phthalocyaninetetrasulphonic acid is obtained by heating a mixture of triammonium 4-sulphophthalate, Co acetate, urea, and boric acid at 220–235°C. Its acidic and neutral NH_4, Na, K, Mg, Ag, Ca, Sr, Ba, and Pb salts are all blue solids. Its solutions, even those of its neutral salt, are slightly acidic. It catalyses decomposition of H_2O_2 in basic solution more effectively than do the corresponding Cu or Ni compounds. C.O.C.

Structure of Aniline Black as indicated by Infrared Absorption Spectra
T. Urbanski and K. Szyc-Lewanska
Bull. Acad. polon. Sci., Classe III, 5, 203–208 (1957):
Chem. Abs., 51, 13576 (25 Sept. 1957)

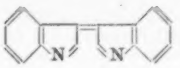
Great similarity exists between the infrared spectra in paraffin of emeraldine (I), Aniline Black (C.I. Pigment Black 1) (II), ungreenable Aniline Black (III), *p*-benzoquinoneimine, *p*-benzoquinonedi-imine (IV), and phenazine. This apparently confirms that I, II, and III may have the same structure as IV. Because there is no NH_2 band in the spectra of I and II it is improbable that they have a quinoneimine structure. The spectrum of III does not confirm a phenazine structure. C.O.C.

Spectrophotometric Study of the Copper–Alizarin Sulphonate Complex
A. K. Mukherji and A. K. Dey
J. Indian Chem. Soc., 34, 461–466 (June 1957)

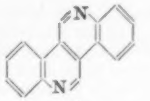
Copper sulphate and alizarin sulphonate (Alizarin Red S —C.I. Mordant Red 3) are shown, by Job's method of continual variation, to form a 1 : 1 complex over the pH range 3·7–4·4. The formation constant of the complex is $3{\cdot}5 \pm 0{\cdot}4 \times 10^5$ and the free energy of formation is —7·63 kcal./mole at 28°C. A.J.

Di-indolyls
S. A. Faseeh and J. Harley-Mason
J.C.S., 4141–4142 (Sept. 1957)

The β-di-indolyl obtained by Gabriel, Gerhard, and Wolter (*Ber. deutsch. chem. Ges.*, **56**, 1032 (1923)) is now shown to be the 2:3'-isomer. Seidel's modification (*ibid.*, **77B**, 787 (1944)) of Madelung's synthesis of 2:2'-di-indolyl (*Annalen*, **405**, 61 (1914)) could not be repeated, but 2:2'-di-indolyl has now been obtained satisfactorily by heating di-*o*-tolyloxamide with sodamide. Oxidation of 3:3'-di-indolyl with lead dioxide gave a lustrous bronze-coloured di-indoleninylidene (I) isomeric with but not capable of being isomerised to 6:12-diazachrysene (II).



(I)

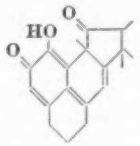


(II)

H.H.H.

Pristimerin. I—Nature of the Chromophore
P. K. Grant and A. W. Johnson
J.C.S., 4079–4089 (Sept. 1957)

The partial structure I is proposed for the closely related wood pigments pristimerin and celastrol, the former being the methyl ether of the latter. Structures are also suggested for dihydropristimerin (pristimerol), an oxidation ($KMnO_4$ in acetone) product of its dimethyl ether, and the different cpd. obtained from I by Thiele acetylation and by acid rearrangement.

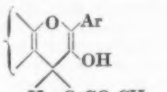


(I)

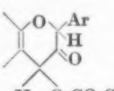
H.H.H.

Conversion of Flavanols into Anthocyanidins
H. G. C. King and T. White
J.C.S., 3901–3903 (Sept. 1957)

Reductive acetylation of flavanols (e.g. quercetin) gives acetates (I) of undetermined structure having one acetyl group less than would be expected, which hot mineral acid converts into the corresponding anthocyanidins smoothly and in good yield. To account for the colour of I, it seems likely that they are acetyl deriv. (II) of the anthocyanidins, or acetates (III) of pseudobases, the two structures being tautomeric.



(II)



(III)

H.H.H.

Mollisin, a Dichloronapthaquinone Derivative produced by the Fungus *Mollisia caesia*
G. J. M. van der Kerk and J. C. Overeem
Rec. Trav. chim., **76**, 425–436 (May 1957)

The yellow pigment mollisin is shown conclusively by chemical degradation methods to be a monomethylated 2 : 3-dichloro-5-hydroxy-8-acetonyl-1 : 4-naphthaquinone. The methyl group is either in the 6 or 7 position. Indirect evidence on A. J. Birch's theory of biosynthesis (*Chem. and Ind.*, 1047 (1954)) favours the 6 position. J.E.B.

Composition of Caramel (C.I. Natural Brown 10)
N. A. Ramaiah, S. K. D. Agarwal, and J. K. P. Agarwal
Current Sci. (India), **26**, 81–82 (1957):
Chem. Abs., **51**, 14152 (25 Sept. 1957)

Chromatographic studies have been made of the composition of caramel prepared from various sugars. Caramel prepared by heating an alkaline solution of the sugar at 100°c. contained in every case four reducing compounds of roughly the same R_f values. When the caramel was prepared by heating a sugar as such, an additional reducing compound was found in addition to the other four. Apparently the composition of caramel varies, not with the sugar used, but with the method used for making it. C.O.C.

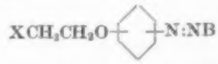
Effect of the Acidity of the Initial Solution on the Light Fastness of Lead Chromate
A. V. Pamfilov and R. Ya. Mushii
J. Appl. Chem. U.S.S.R., **30**, 636–639 (April 1957)

The light fastness of lead chromate is not affected by the pH of the solution from which it has been precipitated over the pH range − 0·7 to + 5·0, but falls markedly when the pH is increased from 6 to 7. This decrease is more noticeable for samples precipitated from acetate soln., which have a lower light fastness in comparison with samples prepared from soln. of lead nitrate.
T.Z.W.

PATENTS

Monoazo Reactive Dyes
U.S. Secretary of Agriculture *USP* 2,741,532

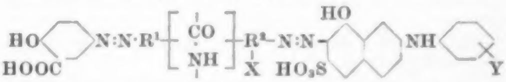
Cellulosic material containing hydroxy groups when etherified in presence of an alkali metal hydroxide with dyes of formula—



(X = ester-forming radical, preferably OSO_3H or Hal; B = polysubstituted aromatic hydrocarbon containing at least two SO_3H or OH radicals or at least one of each) is dyed deeply and fast to washing. Preferably the fibres are impregnated with an aqueous solution of the dye, e.g. 2-(*p*-aminophenoxy)ethylsulphuric acid → resorcinol, dried, impregnated with mercerising lye and baked, e.g. 1 hr. at 110°c. C.O.C.

Copperable Disazo Direct Dyes
Ciba *BP* 784,613

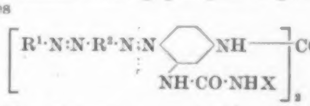
Disazo direct dyes of the type—



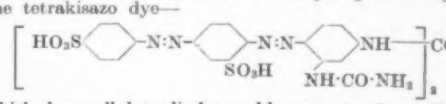
(R^1 and R^2 = benzene residues; X = OH, COOH, or OAlk *ortho* to –N:N–; Y = SO_3H, COOH, or OCH_2·COOH) may be coppered in substance, in the dyebath, or on the fibre, and give mainly browns. Thus 5-(*p*-aminobenzoyl)aminoanthranilic acid is tetrazotised and coupled, first with 1 mol. of salicylic acid, and then in presence of a little pyridine with 1 mol. of *N*-*m*-sulphophenyl-γ acid, to give the disazo dye (X = COOH; Y = *m*-SO_3H). Treatment at 80–85°c. with $CuSO_4$ in presence of acetic acid and sodium acetate gives the copper complex which dyes cotton brown. E.S.

Tetrakisazo Direct Dyes
FBy *BP* 784,622

Diazotised aminomonoazo compounds are coupled with *m*-aminophenylureas, and the aminodisazo compounds so formed are treated with e.g. phosgene to give tetrakisazo direct dyes



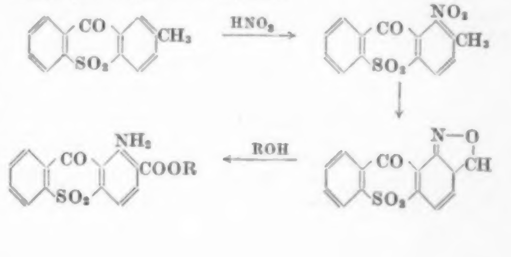
(R_1 and R^2 = benzene or naphthalene series radicals; X = H, Alk, hydroxyalkyl, or Ar). Thus a monoacyl-*m*-phenylenediamine is condensed with phenyl chloroformate in aq. acetic acid to give a urethane which is treated with NH_3 in neutral or alkaline medium, when phenol splits off to give *m*-acylaminophenyl urea. Hydrolysis then gives *m*-aminophenyl urea, which is coupled with diazotised 4-aminoazobenzene-3:4′-disulphonic acid in aq. acetic acid. Condensation with phosgene then gives the tetrakisazo dye—



which dyes cellulose dischargeable orange–red. E.S.

1-Aminobenzophenonesulphone-2-Carboxylic Acids or their Esters
BASF *BP* 783,067

These products, which are intermediates for dyes and may also be used as disperse dyes for acetate rayon, polyamide, polyurethane and polyester fibres, are from 2-methylbenzophenonesulphone.



(R = H, Alk, aryl, aralkyl or *cyclo*alk). Nitration takes place in 96% H_2SO_4 with mixed acids or alkali-metal nitrates. One NO_2 group is introduced at room temperature or at moderately elevated temperature whilst higher temperatures result in the introduction of further NO_2 groups. Treatment with 60–65% oleum at 0–10°C. gives the *iso*oxazole and further treatment with dilute aq. caustic alkali, dilute acid or aliphatic, aromatic, etc., hydroxy compounds gives the appropriate 1-amino-2-COOR derivatives. E.T.

Heavy Metal Compounds of 2:5-Dimercapto-1:3:4-thiadiazole as Pigments

BASF *BP* 783,715

The mono- and di-compounds of 2:5-dimercapto-1:3:4-thiadiazole with Fe, Bi, Cu, Zn, Cd and in particular Pb are very fast to light and oil. They are especially useful for casein body colours for leather. They have good stability to alkali carbonates and acids and are compatible with most solvents and plasticisers. The lead compounds have excellent rust-preventing properties and compared with red lead or lead cyanamide they have the advantage of a smaller lead content and a lower specific gravity. C.O.C.

Hydroxyanthraquinones as Disperse Dyes for Polyester Fibres

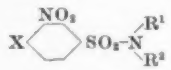
FBy *BP* 779,803

Hydroxyanthraquinones can be used as disperse dyes. The hue depends on the number and position of the hydroxyl groups, thus 1-hydroxy-, 1:2-, 1:5- and 1:8-dihydroxyanthraquinones are yellow dyes and the 1:4-dihydroxy- and 1:2:4- and 1:4:5-trihydroxyanthraquinones are orange. Increase in the number of hydroxy groups turns the dyes to orange, brown or red. C.O.C.

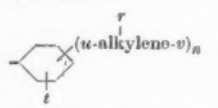
Disperse Dyes—Derivatives of 1-Amino-2-Nitrobenzene-4-Sulphonamide

S *BP* 782,759

Disperse dyes giving yellow dyeings fast to washing, light and gas-fumes on acetate rayon, are obtained by condensing 1 mol.



(X = Cl or Br; R^1 = aliphatic, *cyclo*aliphatic or araliphatic radical, or a subst. or unsubst. benzene, naphthalene or hydronaphthalene radical; R^2 = H or aliphatic radical with $\not> 3$ C) with 1 mol. of an amine HNR^3R^4 (R^3 = subst. or unsubst. aliphatic, *cyclo*aliphatic or araliphatic or a benzene radical of formula—

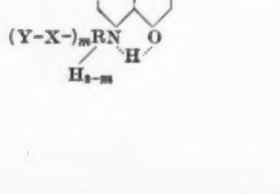


(t = H, $-OCH_3$, $-OC_2H_5$, Alk and/or Hal; u = direct binding or O; r = H or OH; v = alkoxy group which may contain OH or OAlk groups; n = 1 or 2; R^3 is different from R^1; R^4 = H or subst. or unsubst. aliphatic radical). The product must be free from water-solubilising groups and either R^1 or R^3 is or contains a cyclic radical. Condensation is carried out in aq. medium using an acid-binding agent, e.g. $NaHCO_3$ or an excess of amine. Tables illustrating 75 such condensations are given in which product, m.p. and hue on acetate rayon are recorded. E.T.

***NN'*-Diarylnaphthoquinoneimines—Disperse Dyes**

S *BP* 784,156

Green dyes for acetate rayon, polyamide and polyester fibres of good or very good fastness to light, washing and sublimation are—



(R = same or different radicals of benzene or naphthalene series; X = CH_2O, OCH_2O, OCH_2CH_2O, $OCH_2CH_2CH_2O$, $OCH_2CH(CH_3)O$ or $OCH(CH_3)CH_2O$; Y = H, except when X is CH_2O or OCH_2O, or an alkyl radical which may contain ether groups and/or OH groups; n = 1–3 and m = 1–2). They are produced from 1:5-dinitronaphthalene by the following stages: (1) treatment with sulphur sesquioxide yields 5-amino-8-hydroxy-1:4-naphthoquinone-1-imine (naphthazarine), (2) 1 mol. of this intermediate is condensed with 1 mol. of an arylamine

$$\underset{}{H_2N-\overset{H_{3-n}}{\overset{|}{R}}(-X-Y)_{n-1}}$$

and 1 mol. of an arylamine

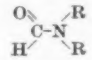
$$H_2N-\underset{H_{2-m}}{\underset{|}{R}}(-X-Y)_m$$

in presence of a condensing agent, e.g. ethanol, benzyl alcohol, or glacial acetic acid. E.T.

Sulphuric Acid Esters of *leuco*-Anthraquinone Vat Dyes

DH *BP* 783,701

Vat dyes which are difficult to esterify— see *BP* 719,621 (J.S.D.C., **71**, 157 (1955))— are treated with chlorosulphonic acid in a mixture of a dialkylformamide

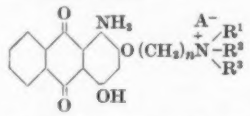


(R = CH_3 or C_2H_5) and methylene-4:4'-bis-(N:N'-diethyl-*cyclo*hexylamine) containing finely divided Fe, Co, Ni, Cu or a Cu alloy. The solvent mixtures used contain 10–70% by weight of methylene-4:4'-bis-(N:N'-diethyl*cyclo*hexylamine) and best yields are obtained when the proportion lies between 25 and 60%. Chlorosulphonic acid may be used as such or as an equivalent mixture of SO_3 and HCl; it may also be reacted with one of the bases first the other base being added later; the metal may also be introduced in various ways to subject it to an etching treatment prior to the esterification process. The proportion of metal required is 1·5 to 2 atoms per anthraquinone nucleus present. E.T.

Quaternary Ammonium Anthraquinone Salts—Pink-Red Disperse Dyes

DuP *USP* 2,737,517

Pink to red dyes having good affinity for polyacrylonitrile fibres, light fastness 6–8 and good sublimation and washing fastness are of formula—

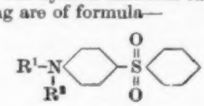


(R^1 and R^2 = Alk of 1–4 C; R^3 = Alk of 1–4 C or aralkyl group of the benzene series; A = anion not conferring insolubility; n = 2–4). They are made, e.g. by reacting 1-amino-4-hydroxy-2-phenoxyanthraquinone (5·3) with 2-dimethylaminoethanol (20·6) and KOH (1) under reflux for 16–24 hr.; the separated 1-amino-2-(2-dimethylaminoethoxy)-4-hydroxyanthraquinone (2·14) in *iso*propanol (19) is then treated with $(CH_3)_2SO_4$ by refluxing 2 hr. and standing overnight to yield methyl[2-(1-amino-4-hydroxy-2-anthraquinonyloxy)-ethyl]trimethylammonium sulphate. In further examples the $(CH_3)_2SO_4$ is replaced by $C_6H_5{\cdot}CH_2Cl$, $(C_2H_5)_2SO_4$ or methyl-*p*-toluenesulphonate. E.T.

Vat Dyes of the Dibenzanthrone Series

General Aniline *USP* 2,739,973

Grey to black vat dyes of excellent fastness to chlorine, light and washing are of formula—



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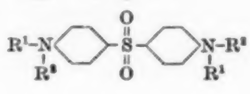


(R^1 = a dibenzanthrone radical; R^2 = H or Alk). They are made by condensing 1 mol. of a diphenylsulphone containing at least one Hal atom with one or two mol. of a dibenzanthrone containing 1–2 amino- or subst. amino-groups. A high boiling organic solvent, e.g. nitrobenzene, trichlorobenzene, etc., an acid binding medium, e.g. Na_2CO_3, Na acetate, etc., and a catalyst, e.g. C.. powder, $CuCl_2$, etc., are used at 205–210°c. E.T.

leuco-Copper Phthalocyanine

DuP *BP* 783,157

Several modifications of the method of *BP* 745,359 (J.S.D.C., **72**, 394 (1956)) are detailed. It is found that hydrated Cu salts (e.g. $CuCl_2{\cdot}2H_2O$, $CuSO_4{\cdot}5H_2O$, $Cu(NO_3)_2{\cdot}3H_2O$, etc.), may be used in place of anhydrous salts whilst a reaction temperature up to 98°c. may be used. In addition to the monoalkylethers of ethylene glycol, lower alkylethers of diethylene glycol are suitable as water-miscible organic reaction solvents. Iminophthalimidine and 1:3-diiminoi*so*indoline are added to the list of suitable catalysts. A major difficulty inherent in the original process was that the leuco-Cu phthalocyanine, after drowning into water and filtering, hydrolysed during drying due to its amorphous form. This problem is overcome by slurrying the leuco-compound in a liquid consisting of one or more water-miscible alcohols boiling below 105°c. and then removing the liquid phase at a temperature not exceeding 60°c. This results in a crystalline and more stable product. E.T.

Metal-free Phthalocyanine or its Derivatives for Dyeing Cellulose

DuP *USP* 2,741,531

Metal-free phthalocyanines or halogen derivatives thereof are treated in a primary or secondary open chain alcohol, *cyclo*hexanol or lower alkoxy ethanol of 2–12 C, e.g. anhydrous ethanol, *n*- or *sec*.-butanol or ethyleneglycolmonomethylether, with a strongly basic compound of an alkali metal, e.g. a hydroxide, alkoxide or hydride of Na or K. This brings the pigment into solution. This solution can penetrate cellulose fibres and by treating the impregnated fibre with water or with a Cu or Ni salt the original metal-free phthalocyanine or the corresponding metal phthalocyanine is generated in the fibre yielding dyeings of the true hue of the pigment. These dyeings have excellent fastness to washing and rubbing.

USP 2,741,534

The solvent used is pyridine, quinoline, 2-picoline, 2:6-lutidine, pyrrole, dimethylformamide or tetramethylenesulphone. C.O.C.

Solvent-stable α- and γ-Metal-free Phthalocyanines

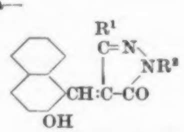
BASF *BP* 783,634

Mixtures of 2–30 mol. of crude metal-free β-phthalocyanine or of the solvent-unstable α- or γ-forms and 1 mol. of a metal-free phthalocyanine containing 1–4 halogen atoms or nitro groups as substituents are pasted with H_2SO_4 of 50–100% strength so that the β-form is converted into the α- or γ-form and the α- or γ-form is, if desired, converted into the γ- or α-form. Instead of the metal-free phthalocyanines, such metal phthalocyanines as yield the free phthalocyanine in presence of acid may be used. The paste is stirred into water to yield the solvent stable pigment. The product has high colour strength and withstands boiling for a long time in benzene, toluene or xylene. C.O.C.

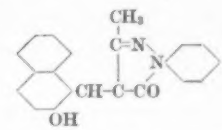
Methin Dyes for Colouring Plastics, etc.

General Aniline *USP* 2,739,963

Dyes of formula—



(R^1 = H, Alk, carbalkoxy or carboxy; R^2 = H, Alk or Ar) are suitable for colouring plastics, resins, lacquers, lithographic inks, etc. They do not bleed excessively and give bright colourations of good fastness to light. Thus the reddish-yellow dye—

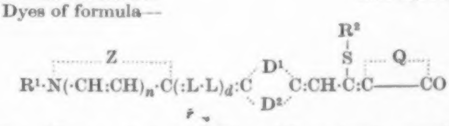


is obtained by refluxing 2-hydroxy-1-naphthaldehyde, with 1-phenyl-3-methyl-5-pyrazolone in methanol using piperidine as catalyst. C.O.C.

*mero*Cyanine Dyes containing a Chain Alkyl- or Arylthio Group

Eastman Kodak Co. *USP* 2,739,965

Dyes of formula—

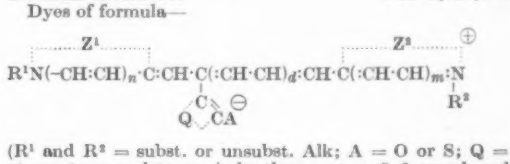


(R^1 = Alk; n = 0, 1 or 2; R^2 = Alk or Ar; L = methin; $D^1 + D^2$ = atoms to complete a thiazolidone nucleus; Q = atoms to complete a thiazole nucleus; Z = atoms to complete a 5- or 6-membered ring), e.g. the blue 3-carbethoxymethyl-5-[4-(3-ethylbenzoxazolin-2-ylidene)-1-ethylthiobut-2-en-1-ylidene]-2-thiothiazolid-4-one, have photographic sensitising properties. 40 Syntheses of such dyes are described. C.O.C.

Non-ionised Cyanine Dyes

Eastman Kodak Co. *USP* 2,739,964

Dyes of formula—

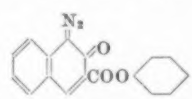


(R^1 and R^2 = subst. or unsubst. Alk; A = O or S; Q = atoms to complete an indanthrone or a 5–6 membered heterocyclic nucleus) n, d and m = 0 or 1; Z^1 and Z^2 = atoms to complete a 5- or 6-membered heterocyclic nucleus) are non-ionised and have photographic sensitising properties. In one example the green dye 5-[di(3-ethyl-2(3H)-benzothiazoylidene)*iso*propylidene]-1-methyl-2-thiobarbituric acid is obtained by refluxing 5-[3-ethyl-2(3H)-benzothiazoylidene)*iso*propylidene]-1-methyl-2-thiobarbituric acid with a large excess of 2-ethylmercaptobenzothiazole ethoethylsulphate and triethylamine in pyridine. 57 other examples are given. C.O.C.

Aryl Esters and Arylides of Naphthaquinonediazide-carboxylic Acids

Kalle & Co. *BP* 784,672

o-Naphthaquinone-diazide-carboxylic acids react with excess thionyl chloride to give the corresponding acid chlorides in good yield, although phosphorus chlorides do not react smoothly. The acid chlorides readily afford aryl esters and arylides by reacting with phenols and amines. Thus 3:2-hydroxynaphthoic acid is coupled with a diazo compound and the azo compound so formed is reduced, giving 1-amino-2-naphthol-3-carboxylic acid. Diazotisation then gives naphthoquinone-(1:2)-diazide-(1)-carboxylic acid-(3), which is heated at 50–60°c. for 30 min. in thionyl chloride. On cooling, the acid chloride separates in 87·5% yield. Treatment in benzene with phenol at 50–60°c. in presence of K_2CO_3 gives the phenyl ester



E.S.

Colour Couplers yielding Yellow Dyes

Ilford *BP* 784,422

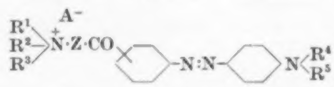
Compounds of formula—

(R^1 and R^2 = Alk of < 5 C; R^3 = subst. or unsubst. aromatic group), e.g. 2:5-dimethoxybenzoylacetanilide,

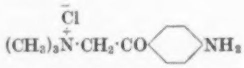
used as colour couplers and developed with an aromatic primary amino developer, particularly 2-amino-5-diethylamino toluene, yield yellow dyes having much less absorption in the violet and ultraviolet regions of the spectrum than they have in the blue region. C.O.C.

Basic Monoazo Dyes for Polyacrylonitrile Fibres
DuP *BP* 785,988

Diazotised aminophenacylammonium salts are coupled with aromatic amines to give basic monoazo dyes—



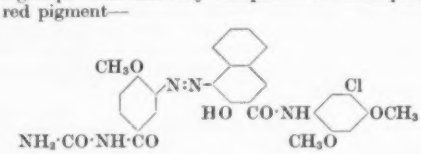
(R^1 = lower Alk; R^2 = lower Alk or hydroxyalkyl; R^3 = lower Alk, hydroxyalkyl, or monocyclic aralkyl; or R^1, R^2, and R^3 may together with the N atom form a heterocyclic group; R^4 = H, lower Alk, hydroxyalkyl, acetylalkyl, cyanoalkyl, chloroalkyl, or monocyclic aryl; R^5 = H, lower Alk, hydroxyalkyl, or cyanoalkyl; Z = alkylene of 1–3 C; A is an anion rendering the dye soluble in water; the acylammonium group is in the *m*- or *p*-position to the azo link; the two benzene rings may contain common substituents, e.g. Cl, Alk, O Alk) have good affinity for polyacrylonitrile fibres, and give oranges and reds of good fastness. Thus acetanilide is condensed with chloroacetyl chloride in sym.-tetrachloroethane in presence of $AlCl_3$ to give *p*-(chloroacetyl)acetanilide, which on treatment with aq. $(CH_3)_3N$, followed by hydrolysis with HCl, gives the quaternary ammonium compound—



This is diazotised and coupled with *m*-chloro-*NN*-diethylaniline to give the water-soluble red-orange monoazo dye. E.S.

Red Monoazo Pigments
FBy *BP* 785,672

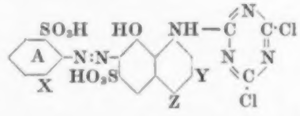
Bright red monoazo pigments are made by coupling a diazotised 3-amino-4-alkoxybenzoyl urea with 3-hydroxy-2-naphtho-5′-chloro-2′:4′-dimethoxyanilide. The diazo components are made by treating a 3-nitro-4-alkoxybenzoyl chloride with urea, followed by reduction of the nitro group. The methoxy compound for example gives the red pigment—



E.S.

Red Monoazo Dyes which Combine with Cellulose
ICI *BP* 785,222

Monoazo reds of formula—



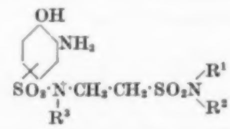
(X = H or a substituent other than Hal; of Y and Z, one = H and the other = SO_3H; A may carry substituents other than OH and amino group) are faster to wet treatments than the similar dyes with only one Cl atom in the triazine ring, and faster to light than those with 2 Cl atoms in the triazine ring but not containing an *o*-sulphophenylazo substituent, examples of both these types being claimed in *BP* 209,723 (J.S.D.C., **41**, 335 (1925)). They are applied to cellulose by impregnation followed by a short fixation treatment using an acid-binding agent. Thus a soln. in acetone of cyanuric chloride is poured into ice and water, and dil. HCl is added, followed by a soln. of the disodium salt of H acid, stirring until no unchanged H acid can be detected. Diazotised orthanilic acid is then added to give the monoazo dye (X and Z = H; Y = SO_3H) which dyes cotton yellowish red.

BP 785,120

Similar dyes are made by using as coupling component a condensation product of 1 mol. of cyanuric chloride with 1 mol. of J acid (or its *N*-acyl derivatives) in place of the 1-amino-8-naphtholsulphonic acid. E.S.

Metal(Chromium)-complex Monoazo Dyes for Wool
FBy *BP* 784,635

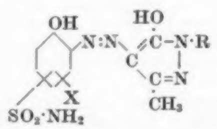
Substituted sulphonamides of *o*-aminophenols—



(R^1, R^2 = H, Alk, or subst. Alk; R^3 = Alk, esp. CH_3) are diazotised and coupled with suitable *ortho*-coupling hydroxy-compounds to give monoazo compounds, free of SO_3H groups, whose 2 : 1 complexes with Cr dye wool from neutral or weakly acid baths. Thus 1-chloro-2-nitrobenzene-4-sulphonylchloride is condensed with methyltaurine, the product is converted into the acid chloride and then into the sulphonamide, and the Cl atom is hydrolysed to OH and the NO_2 group reduced to NH_2 giving 2-aminophenol-4-sulphomethylaminoethane-sulphonamide (R^1, R^2 = H; R^3 = CH_3). This is diazotised and coupled under alkaline conditions with 1-acetylamino-7-naphthol, and the monoazo compound so formed dissolved in aq. NaOH and stirred at 80°C. with $K_2Cr_2O_7$ and glucose, giving the Cr complex which dyes wool black-blue. E.S.

Metal(Cobalt and Chromium)-complex Monoazo Pyrazolone Dyes for Wool, Nylon, etc.
Ciba *BP* 785,026

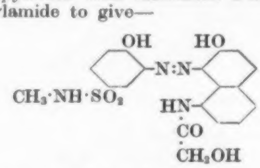
The metal complexes containing 1 atom of Co or Cr to 2 mol. of monoazo pyrazolone dyes free of SO_3H and COOH groups—



(X = H or Cl; R = diphenyl or naphthyl) dye wool, nylon, etc. from neutral or weakly acid baths. Thus the monoazo compound 2-aminophenol-4-sulphonamide → 3-methyl-1-*p*-phenylphenyl-5-pyrazolone is dissolved in aq. NaOH and boiled with sodium chromosalicylate to give a complex which dyes wool orange. E.S.

Blue and Grey Metallisable Monoazo Dyes for Wool, Nylon, etc.
S *BP* 785,345

Diazotised *o*-aminophenol and *o*-anisidine and their sulphonamides and nitro, etc., derivatives are coupled with *N*-hydroxyacyl derivatives of 1-amino-7-naphthol to give monoazo dyes which may be metallised in substance, on the fibre, or in the dyebath. The most useful hydroxyacyl groups are hydroxyacetyl and carbo-β-hydroxyethoxy. Thus 1-chloroacetylamino-7-naphthol is heated in formamide at 160–180°C. to give the hydroxyacetyl compound, which is coupled in presence of aq. Na_2CO_3 and pyridine with diazotised 2-aminophenol-4-sulphonmethylamide to give—

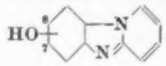


which dyes wool grey by the afterchrome or metachrome process. E.S.

Pyridobenzimidazol Azo Dyes
General Aniline *USP* 2,742,457

Condensation of heterocyclic bases containing a 2-aminopyridine nucleus with 1:4-quinones gives hydroxypyrido-(1:2-a)-benzimidazol compounds, which couple with diazo compounds, to give azo dyes. Thus acid

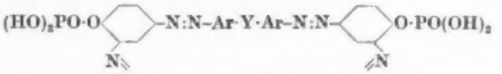
condensation of 1:4-benzoquinone and 2-aminopyridine according to the method of *Monatshefte*, **83**, 34 (1952) gives 7(or 8)-hydroxypyrido-(1:2-a)-benzimidazol—



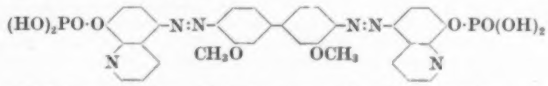
which couples with 5-diazosalicylic acid to give an azo compound which dyes wool yellowish brown, deepened in hue by afterchroming. E.S.

Phosphated Disazo Direct Dyes for Aftercoppering
ICI *BP* 785,038

The phosphato derivatives of disazo compounds similar to those whose sulphato derivatives are claimed in *BP* 761,776 (J.S.D.C., **73**, 66 (Feb. 1957)) lose their phosphato groups when aftercoppered on cellulose and give dyeings of good fastness to light and wet treatments. They are of formula—



(the N atoms *ortho* to the O·PO(OH)$_2$ groups are parts of heterocyclic rings; Y = direct link or suitable bridging group; Ar = phenylene, which may carry substituents). Thus the disazo compound dianisidine ⇉ (8-hydroxyquinoline)$_2$, suspended in pyridine, is heated with P_2O_5 at 110°c. for 1 hr. to give—



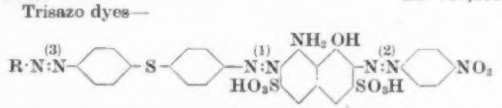
which dyes cellulose rubine by the acidic aftercoppering process. E.S.

Phosphated Metallisable Azo Direct Dyes
ICI *BP* 785,457

Metallisable azo dyes made by diazotising *o*-aminophenol phosphoric esters and coupling with *ortho*-coupling hydroxy compounds are applicable to cellulose by an aftercoppering process, and are more readily soluble than the similar dyes of *BP* 747,872 (J.S.D.C., **72**, 361 (1956)) made from diazotised *o*-aminophenol sulphuric esters. Thus *o*-nitrophenol is treated with P_2O_5 in a mixture of triethylamine and ethylene dichloride and the product reduced with iron and $FeSO_4$, to give *o*-aminophenol phosphoric ester. This is diazotised and coupled with an alkaline soln., containing β-ethoxyethanol, of 4:4′-bis(3″-methyl-5″-one-1″-yl)diphenyl (prepared from 4:4′-diaminostilbene by tetrazotising, converting to the bishydrazine, and condensing with 2 mol. of ethyl acetoacetate). The disazo dye so formed dyes cotton orange by the aftercoppering process. E.S.

Green Trisazo Leather Dyes
BASF *BP* 785,101

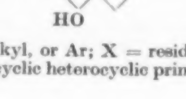
Trisazo dyes—



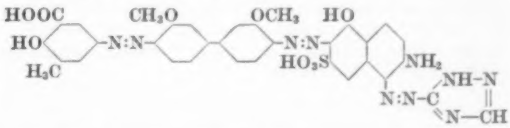
(R = residue of a phenol, cresol, resorcinol, etc.) dye leather green, and are prepared by coupling tetrazotised 4:4′-diaminodiphenyl sulphide with 1 mol. of H acid, then adding diazotised *p*-nitroaniline, and finally an alkaline soln. of the phenol. E.S.

Copperable Trisazo Direct Dyes
Gy *BP* 784,665

Copperable trisazo direct dyes are made by coupling a tetrazotised 3:3′-dialkoxybenzidine first with 1 mol. of salicylic acid (or its derivatives) and then with 1 mol. of a monoazo compound—



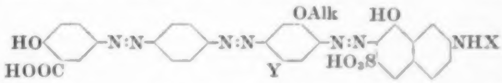
(R = H, Alk, aralkyl, or Ar; X = residue of a diazotised heterocyclic or isocyclic heterocyclic primary amine). Thus tetrazotised dianisidine is coupled first with 1 mol. of 3-methylsalicylic acid, and then with 1 mol. of the acid-coupled monoazo compound 5-amino-1:2:4-triazole → J acid, to give the trisazo compound—



which dyes cellulose dark violet, converted to black by aftercoppering. E.S.

Trisazo Direct Dyes for Aftercoppering
Ciba *BP* 784,879

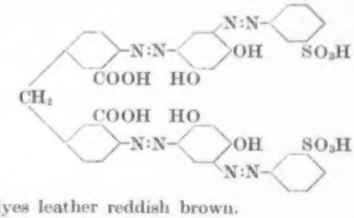
Suitable aminoazo compounds are diazotised and coupled with *o*-alkoxyanilines, and the aminodisazo compounds so formed are then diazotised and coupled with γ acid (or its *N*-acyl derivatives) to give *o*-alkoxy-*o*′-hydroxyazo compounds of the type—



(X = H or acyl; Y = H, Alk, or OAlk). Treatment with a metal (esp. Cu) compound then gives the complex (with de-alkylation of the OAlk group), which is demetallised to give the desired *oo*′-dihydroxy compound. The products are direct dyes suitable for aftercoppering. Thus the trisazo dye (X = H; Y = OCH_3; Alk = CH_3) is stirred at 95°c. with ammoniacal $CuSO_4$ for 24 hr., and the pptd. Cu complex is demetallised by stirring with cold conc. HCl. The product dyes cotton greenish black by the single- or two-bath aftercoppering method. E.S.

Brown and Black Metal-complex Polyazo Dyes for Leather
BASF *BP* 785,084

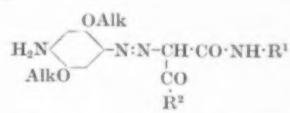
The Cu, Co, and Cr complexes of polyazo dyes obtained by coupling tetrazotised 4:4′-diaminodiphenylmethane-3:3′-dicarboxylic acid (which may have a CH_3 or C_6H_5 group on the methane C atom) with 2 mol. of hydroxy- or amino-azo compounds containing together at least 2 SO_3H groups, dye leather dark brown or black. Alternative syntheses are also described. Thus 2 mol. of anthranilic acid are condensed with 1 mol. of formaldehyde to give 4:4′-diaminodiphenylmethane-3:3′-dicarboxylic acid which is tetrazotised and coupled with 2 mol. of resorcinol. The disazo product is then coupled with 2 mol. of diazotised metanilic acid to give the tetrakisazo dye—



which dyes leather reddish brown. E.S.

Red Azoic Dyes and Pigments
FH *BP* 784,781

By coupling a diazo compound of an aminomonoazo compound—

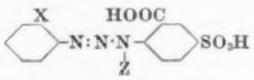


(R^1 = Ar, cycloalkyl, aralkyl, or heterocyclic radical; R^2 = CH_3 or phenyl) with an arylide of acetoacetic acid or of terephthaloyl-bis-acetic acid, in substance or on the fibre, bright reds are produced, in contrast to the yellows given by these coupling components with the diazo compounds commonly used in azoic dyeing and printing. Thus, 2:5-dimethoxy-4-nitroaniline is diazotised and

coupled with *N*-acetoacet-*m*-anisidide, and the nitro group is then reduced, giving the aminomonoazo compound (R^1 = *m*-anisoyl; R^2 = CH_3). A diazo soln. prepared from this, suitably thickened and printed on to cotton impregnated with alkaline acetoacet-4-chloro-2:5-dimethoxyanilide gives, after drying and passing through boiling aq. Na_2CO_3, a scarlet print. E.S.

Azoic Dyes— Triazenes from *N*-Substituted-5-Sulphoanthranilic Acids
Ciba *BP* 785,613

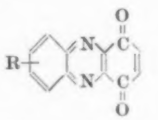
Diazotised amines free from solubilising groups are combined with *N*-alkyl(or benzyl)-5-sulphoanthranilic acids to give triazenes of the type—



(X = H, CH_3, OCH_3, OC_2H_5, or Cl; Z = CH_3, benzyl or Alk of 2–4 C). The substituent Z is chosen with reference to the pK_A value of the particular diazotisable amine used. The triazene is isolated by rapid drying (e.g. spray- or roller-drying) of the reaction mixture. Thus diazotised 2-amino-5-chlorotoluene is run into an alkaline soln. of *N*-methyl-5-sulphoanthranilic acid, together with 30% aq. NaOH to maintain the pH value at 9·5–10, at a low temperature. After screening, the soln. obtained is spray-dried to give a water-soluble powder having a content of ca. 50% of the diazoamino compound. E.S.

Phenazine Quinones
FBy *BP* 784,670

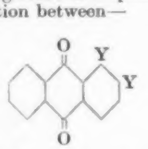
Phenazine quinones—



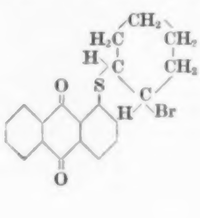
(R = H, Hal, Alk, –OH, –O Alk or acyloxy group), some of which are dyes, are prepared by oxidising 1:4-dihydroxyphenazine with the oxide or oxygen-acid of a halogen, especially bromic acid or its salts. Thus, 1:4-dihydroxyphenazine (0·5 g.) is dissolved or suspended in glac. acetic acid (25 ml.). A solution of 0·5 g. K bromate in water (7 ml.) is added with stirring at room temperature. Further additions of water are made at short intervals and the mixture is ice cooled. An 87% yield of phenazine quinone is obtained. E.T.

Anthraquinone Dyes and Intermediates
Ciba *BP* 784,786

Anthraquinone derivatives used as intermediates for vat dyes or directly as pigments or disperse dyes are produced by an addition reaction between—



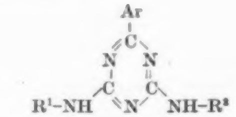
(Y = H in one position and –S Hal or –S–SCN in the other position) and an unsaturated compound containing such groupings as $>C=C<$ or $-\overset{|}{C}=\overset{|}{C}-C\leqslant$, e.g. *cyclo*hexene, styrene, 2-methyl-1-phenylethylene, *iso*butylene and butadiene. Thus, anthraquinone-1-sulphenyl bromide (10), *cyclo*hexene (12) and glac. acetic acid (250) are refluxed for 10 min. The filtered solution is cooled to give—



Further reaction can be carried out to replace the Hal atom by a primary, secondary or tertiary amino group, an acyloxy, alkoxy or hydroxyl group. E.T.

Anthraquinone Triazine Vat Dyes
BASF *BP* 784,926

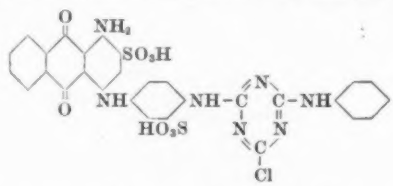
Vat dyes of formula—



(R^1 and R^2 = vattable anthraquinone radicals; Ar = aromatic radical or heterocyclic radical of aromatic character) are produced by the following stages; (1) preparation of a 2:6-diamino-4-Ar-1:3:5-triazine, (2) conversion to a 2:6-dihydroxy-4-Ar-1:3:5-triazine by saponification with caustic alkali solution, (3) conversion to 2:6-dihalogeno-4-Ar-1:3:5-triazine with P or S halides and (4) condensation of 1 mol. of this product with 2 mol. of an aminoanthraquinone. The advantage of the present process is that the four stages can be carried out using only two reaction vessels. Thus, KOH (10), benzonitrile (100), glycolmonomethylether (200) and dicyandiamide (100) are gradually heated to 90–100°c. with stirring. Condensation to 4-phenyl-2:6-diamino-1:3:5-triazine occurs with spontaneous heating. The melt is then boiled for 4 hr., cooled to 90°c., 50% NaOH (400) added, and the melt brought to 120–125°c. This temperature is held for 8 hr. and the 4-phenyl-2:6-dihydroxy-1:3:5-triazine is precipitated as its di-sodium salt. Dilution at 90°c. with water (4000) and filtration follows; 20% HCl added to the filtrate then produces a pasty mass of the mono-sodium salt which becomes mobile at pH 4. Standing, filtration, washing and drying gives the product in 96% yield. The intermediate (38), nitrobenzene (800) heated at 100–110°c. with PCl_5 (92) gives a solution containing 4-phenyl 2:6-dichloro-1:3:5-triazine from which excess PCl_5 is removed at reduced pressure. 1-Aminoanthraquinone (92) in solution in nitrobenzene (1000) is added; the vat dye is formed by heating 3 hr. at 120°c. and is separated by filtration, methanol washing and drying. E.T.

Anthraquinone Dyes for Wool and Polyamide Fibres
Ciba *BP* 784,221

Blue dyes, suitable for wool, polyamide and polyurethane fibres are applied from dyebaths of pH 5–7 and give dyeings, or prints, of good light fastness and excellent washing and fulling fastness. They are of formula R–X–B (R = res. of anthraquinone dye; X = N bridge; B = non-dyeing heterocyclic compound containing a single exchangeable Hal atom bound to the heterocyclic nucleus and no aromatically bound NH_2 or OH groups; either B or R and preferably R, contains a sulphonic acid group), e.g.

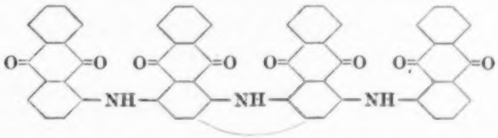


The dyes are made by (1) condensing with, e.g. 1 mol. cyanuric chloride, 1 mol. of an amino-, mercapto- or oxy-compound to give a dihalogenotriazine and (2) condensing this product, in presence of Na acetate or carbonate, with an anthraquinone dye containing a reactive NH_2 group in an external nucleus so that the final product still contains one exchangeable Hal atom. This condition is achieved by carrying out the condensation in an organic solvent or, by using a relatively low reaction temperature, in aqueous medium. A table lists 27 final products giving reddish-blue to greenish-blue dyeings on wool. E.T.

Anthraquinone Vat Dyes and Pigments
Ciba *BP* 784,396

Modification of *BP* 693,075 (J.S.D.C., **69**, 386 (1953)) and *BP* 703,502 (J.S.D.C., **70**, 201 (1954)). Grey vat dyes, which may also be used as pigments, are produced by

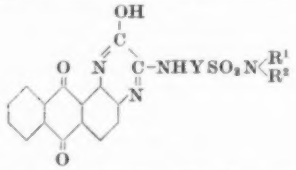
treatment with a carbazolising agent of compounds containing 4–6 anthraquinone nuclei linked by –NH– in the 1 : 4 positions at least one of which –NH– groups is present as an anthrimide bridge and at least one of which the N atom forms part of a carbazole nucleus, e.g.—



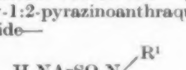
The preferred carbazolising agent is $AlCl_3$ to which fluxes are added, e.g. nitrobenzene, NaCl, SO_2 or tertiary bases such as pyridine, α-picoline or $(C_2H_5)_3N$. The process is carried out at 120–180°c. The products give better matching dyeings on different cellulosic fibres and, in some cases, higher fastness than the earlier products obtained by carbazolising linear polyanthrimides. E.T.

Pyrazino-anthraquinone Vat Dyes
BASF *BP* 784,476

Yellow to orange-red vat dyes of great clarity and good fastness when dyed or printed on cellulosic, wool, polyamide or polyurethane fibres are of formula—



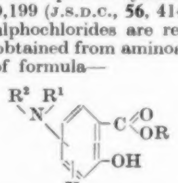
(R^1, R^2 = same or different, H, Alk, *cyclo*Alk, Ar or members of a saturated N-containing ring; Y = benzene or naphthalene radical; Alk, Ar, alkoxy and/or Hal substituents may be present in aromatic rings of the side-chain and/or in the anthraquinone nucleus). The dyes may be produced by two different routes viz.— (1) by reacting Pz-halogeno-hydroxy-1:2-pyrazinoanthraquinones with an aminoarylsulphonamide—



or (2) by first reacting Pz-arylamino-hydroxy-1:2-pyrazinoanthraquinones with chlorosulphonic acid and then treating the product with NH_3, primary or secondary aliphatic, *cyclo*aliphatic, or aromatic amines. Reaction (1) above is preferably carried out in an inert solvent, e.g. nitrobenzene or a chlorobenzene, between 80°c. and the solvent b.p. The starting material for reaction (2) above is prepared by the method of *BP* 471,743 (J.S.D.C., **54**, 80 (1938)) and reacted with $ClSO_3H$ at 30–120°c., separated by pouring on to ice and filtering, the filter-cake being then directly reacted with ammonia or an amine. E.T.

Phthalocyanine (Chrome) Dyes
FBy *BP* 785,629

Particularly valuable phthalocyanine dyes of the type claimed in *BP* 520,199 (J.S.D.C., **56**, 414 (1940)), in which phthalocyanine sulphochlorides are reacted with amino-salicylic acid, are obtained from aminoalkyl aminosalicylic acid derivatives of formula—



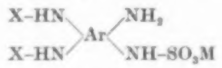
(X = H or sulpho group; R = H, monovalent metal, alk, *cyclo* Alk, Ar or aralkyl; R^1 = H or Alk; R^2 = primary or secondary amino-substituted Alk *or*, where R^1 is H, a tertiary amino-substituted Alk). The phthalocyanines used may contain Co, Ni or Cu and $-SO_2Cl$ groups in the 3- or 4-positions of the benzene rings or in a side-chain. Reaction with the amino-alkyl amino-salicylic acid occurs easily in water to which an acid-fixing agent, e.g. NaOH or $NaHCO_3$, is usually added. E.T.

Phthalocyanine (Sulphur) Dyes
C *BP* 784,353

Dark green sulphur dyes of good fastness to washing and light are obtained by heating blue-green to green S-containing phthalocyanine derivatives with S at 180–265°c. The starting material contains Cu, Co or Ni and SH, SCH_3 or SCN groups and may be obtained by (*a*) reduction of phthalocyanine sulphochlorides, (*b*) reaction of phthalocyanines with $AlCl_3/S_2Cl_2$ complexes (e.g. $AlCl_3{\cdot}2S_2Cl_2$) or (*c*) conversion of NH_2 groups of amino-phthalocyanines into mercaptan groups. The products of the S melt process contain higher percentages of S than the starting materials and dye from Na_2S baths. E.T.

Oxidation Colouring Matters
Fran *BP* 783,321

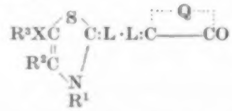
Sulphamic acids or sulphamates of formula—



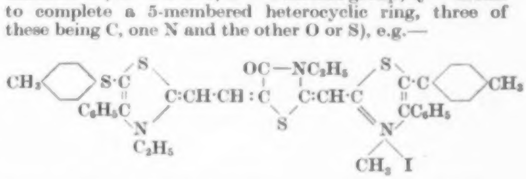
(X = H or SO_3M; Ar = aromatic radical residue; M = monovalent cation) are oxidised in cellulosic fibres to give dyeings of excellent light and washing fastness. The above compounds are prepared by sulphonating one or more NH_2 groups of derivatives of formula Y_2ArNH_2, $Y_2Ar(NH_2)_2$, $YAr(NH_2)_3$ or $Ar(NH_2)_4$ (Y = NO_2 or acylamino group). E.T.

Polymethin Dyes containing 4-Aryl-5-aryloxy- or 5-Arylthiothiazole Nucleus
Eastman Kodak Co. *USP* 2,743,272

Dyes of formula—



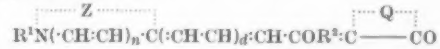
(R^1 = Alk or Ar; R^2 and R^3 = same or different, subst. or unsubst. Ar; X = O or S; L = a methin group; Q = atoms to complete a 5-membered heterocyclic ring, three of these being C, one N and the other O or S), e.g.—



have photosensitising properties. C.O.C.

***mero*Cyanine Dyes containing a Chain Substituent**
Eastman Kodak Co. *USP* 2,743,273

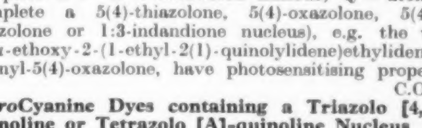
Dyes of formula—



R^1 = Alk; R^2 = Alk; *n* and *d* = 0 or 1; Z = atoms to complete a 5- or 6-membered nucleus; Q = atoms to complete a 5(4)-thiazolone, 5(4)-oxazolone, 5(4)-*iso*-oxazolone or 1:3-indandione nucleus), e.g. the violet 4-[α-ethoxy-2-(1-ethyl-2(1)-quinolylidene)ethylidene]-2-phenyl-5(4)-oxazolone, have photosensitising properties. C.O.C.

***mero*Cyanine Dyes containing a Triazolo [4,3-a]-quinoline or Tetrazolo [A]-quinoline Nucleus**
Eastman Kodak Co. *USP* 2,743,274

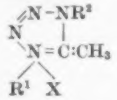
Dyes of formula—



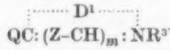
(R = Alk; D = atoms to complete a benzenoid nucleus; *n* = 0 or 1; Q^1 = N or methin; Q^2 = atoms to complete a 5- or 6-membered heterocyclic ring), e.g. the green 3-ethyl-5-[(3-ethyl-5(3H)-*s*-triazolo[4,3-*a*]quinolylidene)-ethylidene]rhodamine, have strong photosensitising properties. C.O.C.

Cyanine Dyes
Ilford *BP* 785,334

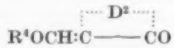
When a compound of formula—



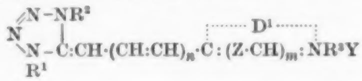
(R^1 = Alk or hydroxyalkyl; R^2 = Alk, *cyclo*alkyl, subst. or unsubst. Ar; X = acid radical), is treated with a compound of formula—



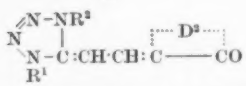
(m = 0 or 1; R^3 = Alk or hydroxyalkyl; Y = acid radical; Z = ·CH: or ·N: ; D^1 = atoms to complete a 5- or 6-membered ring; Q = a thioether, thioethervinyl or acetanilidovinyl group) or with one of formula—



(R^4 = Alk; D^2 = residue of a heterocyclic nitrogenous ketomethylene nucleus) dyes of formula—



or



(n = 0 or 1) are produced. Thus the yellow dye (1-*m*-chlorophenyl-4-methyl-5-tetrazole)(1-ethyl-4-quinazoline)-monomethin cyanine perchlorate is obtained from 4:5-dimethyl-1-*n*-chlorophenyltetrazolium iodide and 1-ethyl-4-ethylthioquinazolinium iodide. C.O.C.

Carbon Black
Phillips Petroleum Co. *BP* 784,947

A method of obtaining improved combustion of the tangential fuel gas in processes of the type described in *BP* 679,818–20 (J.S.D.C., **68**, 528 (1952)). C.O.C.

Coated Titanium Dioxide Pigments for Styrene Polymers
Union Carbide Corpn. *BP* 785,393

Rutile or anatase TiO_2 is treated with an organosilane which is then hydrolysed to form silanols which are condensed to form polysiloxanes. The product imparts uniform and stable coloration to moulded or extended styrene articles. An opaque white is produced by use of 1–5% of the treated pigment and 0·1% will produce a translucent white. C.O.C.

Finely Dispersed Pastes of Organic or Inorganic Pigments
FBy *BP* 784,662

The pigment is kneaded with $\nless$ 10%, preferably 50–90%, by wt. on the pigment, of a polyglycol ether, if desired, with addition of water or other diluent. The proportions of the ingredients should be such that the initial viscosity is $\nless$ 2000 cp. The products are readily and homogeneously dispersed by simple stirring into aqueous or nonaqueous media. C.O.C.

Readily-dispersible Pigments
Armour & Co. *BP* 785,388

If an aqueous precipitate of a pigment is treated so as to coat the particles with a water-insoluble diacid salt of a N-aliphatic alkylene diamine, e.g. N-tallowtrimethylene-diaminetriacetate the coating is not removed during filtration and prevents agglomeration of the pigment. The resulting pigments are ground or dispersed much more quickly with oil- or resin-type vehicles and there is no adverse effect upon the properties of the coating compositions made from them. C.O.C.

Dyeing Nitrogenous Fibrous Material (VIII p. 66)
Dyeing or Printing Polyacrylonitrile Fibres (VIII p. 66)
Dyeing with Insoluble Basic Phthalocyanine Dyes (VIII p. 67)
Mixtures of Ionised and Non-ionised Dyes as Photographic Sensitisers (IX p. 67)
Photoreduction of Bound Dyes (XIV p. 75)
Investigation of Pigment Defects in Coatings by Modern Physical Methods (XIV p. 75)

V—PAINTS; ENAMELS; INKS

Hiding Power of White Pigments
F. Munk

Paint Manuf., **27**, 217–222 (1957): *Chem. Abs.*, **51**, 12504 (25 Aug. 1957)

The hiding power of white pigments depends on the reflectivity and the coefficient of scatter of the paint, visual sensitivity of the observer, and the deflectance of the background. The two-constant theory, relating to these facts, is described and experimental evidence of its validity given. C.O.C.

Machine Output in the Fine Grinding of Lacquer Pigments
R. Holmström

Färg Lack, **3**, (1), 1–11 (1957): *Chem. Abs.*, **51**, 14286 (25 Sept. 1957)

Statistical records of the hourly output of pigment mills, mostly three-roll machines, based on the grinding of 3000 tons of pigment including 400 tons of lacquer material, provide data for setting up standards of normal output for given conditions. Deviation from the norm either in the course of the daily grind or from batch to batch indicates abnormal conditions that may require attention. A typical bar graph, for example, shows in ascending order the normal output of a three-roll mill, from 10 kg./hr. for Maroons I and II to 45–8 for Para Red (C.I. Pigment Red 1) and Chrome Orange (C.I. Pigment Orange 21). Carbon Blacks (C.I. Pigment Black 6 and 7) are fairly constant at 30–40 kg./hr. but sometimes production may mount up to 60. Chrome Yellow (C.I. Pigment Yellow 34) and yellow iron oxide grindabilities vary greatly. No correlation between output and preliminary maturing of the paste was found. In grinding some pigments, e.g. Carbon Black and Umber, addition of a dispersing agent, e.g. lecithin, increases the output. The white pigments TiO_2 and ZnO are easy to grind. With a one-roll mill outputs were 400 and 250 kg. respectively; with a two-roll mill TiO_2 production may reach 600 kg./hr. Besides the chemical and physical conditions of the paste certain mechanical details, e.g. re-machining of the rolls, adjusting the scrapers, etc., are small but important factors influencing output. C.O.C.

PATENTS

Pigmented Siloxane Coating Compositions
Westinghouse Electric Corpn. *USP* 2,743,192

Compositions containing (*a*) a solvent-soluble, heat-hardenable organosiloxane resin (100 parts by wt.), (*b*) flake aluminium (C.I. Pigment Metal 1) (70–125) of which 90% will pass through a 325 mesh sieve, (*c*) a finely divided inorganic refractory (12–20% on the wt. of Al) passing through a 325 mesh sieve (i.e. of particle size $< 44\,\mu$), and (*d*) a volatile solvent (60–300) have much better thermal resistance than previously known organosiloxane coatings. C.O.C.

Emulsion Paint Vehicle
W. R. Grace & Co. *BP* 785,406

An aqueous dispersion containing (*a*) a copolymer formed from vinyl acetate (825–675 parts by wt.) and a diester of maleic and fumaric acid and a straight or branched chain saturated aliphatic monohydric alcohol of 2–8 C, and (*b*) hexylene glycol, 3-chloro 1:2-propanediol, 2(β-butoxyethoxy)ethanol, 2-butoxyethanol acetate or dipropyleneglycol (5–17% on wt. of the copolymer) is a good vehicle for water-based paints. The films it yields are permanently flexible, remarkably unsusceptible to water and are stable to wet abrasion with soap solution. C.O.C.

Driers (III p. 49)
2-Ethylhexoic Acid Derivatives of Zirconylic Acid as Driers (III p. 49)
Thermosetting Coating Compositions Curable at Room Temperature (III p. 50)
Zinc Tetroxychromate in Priming Paints (IV p. 53)
Zinc Dust in Anti-corrosive Paints (IV p. 53)

VI—FIBRES; YARNS; FABRICS

Influence of Degree of Polymerisation and Cellulose Concentration in Viscose on some Physical Properties of Regenerated Cellulose Fibres—II
H. Klare

Faserforsch. und Textiltech., **8**, 262–267 (July 1957)

Viscoses of varying cellulose concentration are obtained from celluloses degraded to different extents. The strength of fibres spun from these viscoses depends primarily on the D.P. of the cellulose. With increasing concentration of cellulose the strength passes through a maximum at 6–8% cellulose. Low D.P. cannot be compensated for by increased cellulose concentration. W.R.M.

Influence of Coagulation Baths on the Deformation of Isotropic Model Cellulose Filaments
H. Klare and A. Gröbe

Faserforsch. und Textiltech., **8**, 310–317 (Aug. 1957)

Univalent cations in the coagulating bath have little effect on the elastic part of the deformation of model filaments from cellulose xanthate and cellulose hydrate. Bivalent cations reduce the value of the elastic part, suggesting a condensation of the gel structure. The influence of zinc and cadmium salts on xanthate filaments varies with the concentration and leads to the formation of distinct skin zones, which remain after decomposition of xanthate and deformation. W.R.M.

Cellulose Triacetate—Production, Spinning, and Properties
D. Finlayson and E. B. Thomas

Chem. and Ind., 928–935 (6 July 1957)

Processes for the production of cellulose triacetate are described. Differences between dry-spun, wet-spun, and melt-spun yarns are discussed, and some advantages of dry-spun acetate yarns considered. The history of triacetate is outlined, and methods for increasing crystallinity and orientation are discussed. W.R.M.

Diffusion of Acid Ions in Keratin. I—The "Chemical" Diffusion Coefficient for Sulphuric Acid
J. A. Medley

Trans. Faraday Soc., **53**, 1380–1389 (Oct. 1957)

The ionic self-diffusion coefficients and the "chemical" diffusion coefficients for sulphuric and hydrobromic acids have been measured in water-saturated horn keratin. When the ionic diffusion coefficients increase rapidly with acid concentration in keratin, the chemical diffusion coefficient of the acid is greatly magnified with respect to the harmonic mean of the two ionic diffusion coefficients. In the case of sulphuric acid a considerable increase in the anionic self-diffusion coefficient with concentration occurs. This is explained by assuming that the SO_4^{2-} ion has negligible mobility compared with the HSO_4^- ion and that the normal dissociative equilibrium operates with respect to these ions. W.R.M.

Effect on Wool of Boiling in Aqueous Solutions. III—Acids and Acidic Salt Solutions
R. V. Peryman

J.S.D.C., **73**, 455–459 (Oct. 1957)

Worsted yarn of 64s quality is boiled at controlled pH values and for times simulating commercial dyeing in a package-dyeing machine using sulphuric, phosphoric, formic, acetic, oxalic, and hydrochloric acids with and without salts. Changes produced in the wool, as measured by alkali solubility or alternatively by urea–bisulphite solubility, are related to the pH value of the treatment solution at 100°C., which is obtained by extrapolation of measurements at lower temperatures. Sulphuric acid is found to be the most active of the acids but, in terms of the pH value of the cooled solution, sodium sulphate–sulphuric acid solutions are exceptional in having an "apparent" protective action, which is attributed to the rise in pH with rise in temperature. Practical implications are discussed. AUTHOR

Dynamic Mechanical Behaviour of Some Nylons
A. E. Woodward, J. A. Sauer, C. W. Deeley, and D. E. Kline

J. Colloid Sci., **12**, 363–377 (Aug. 1957)

Dynamic mechanical behaviour of 6,6-nylon, 6,10-nylon, and a nylon copolymer have been studied in the audio-frequency region at temperatures between 80°K. and the m.p. In all cases four dispersion regions were observed, the first three being at temp. of approx. 170°, 250°, and 350°K. The magnitudes and temperature positions of damping maxima depend on the specific nylon type. Over parts of the temp. range the damping of 6,6-nylon depends on the thermal history and the water content of the samples. Correlations between dynamic mechanical data and the results of other physical measurements are given. W.R.M.

Viscosities of Polycaproamide Solutions in Concentrated Sulphuric Acid—II
W. Dawydoff

Faserforsch. und Textiltech., **8**, 267–274 (July 1957)

The relative viscosities of solutions of polycaproamides in concentrated sulphuric acid depend on the temperature and the concentration of the acid. There is a roughly linear relationship between relative viscosity and concentration of acid. Polyelectrolyte effects are observed with very dilute solutions. Relative viscosity decreases on storage of solutions. W.R.M.

Ban-Lon
Anon.

Teintex, **22**, 673–679 (Sept. 1957)

Suggestions for preparing, dyeing with disperse, acid, and chrome dyes, and finishing with maximum bulking, are given. The latter include conditioning for at least 8 days; wetting-out at 20°C. and hot-air drying at 60°C.; or steaming without tension. S.R.C.

Molecular-weight Determination in Polyethylene Terephthalate
I. M. Ward

Nature, **180**, 141–142 (20 July 1957)

A method based on deuteration of end-groups is used to determine the number-average molecular weight $\overline{M}_n$. Intrinsic viscosities in *o*-chlorphenol of samples of different $\overline{M}_n$ have been determined. The relationship between intrinsic viscosity $[\eta]$ and $\overline{M}_n$ is found to be $[\eta] = K\overline{M}_n^{\,a}$, where $a = 0{\cdot}77 \pm 0{\cdot}09$ and $K = (3{\cdot}0 \pm 1{\cdot}2) \times 10^{-4}$. W.R.M.

Cotton Fibres as Means of Transmitting Water Vapour
L. Fourt, R. A. Craig, and M. B. Rutherford

Text. Research J., **27**, 362–368 (May 1957)

The water-vapour transmission of fibres can be measured independently of any air space surrounding the fibres, by using sections cut from embedments of the fibres in polyacrylic resins. The rate of water-vapour transmission, measured as the diffusion constant, is larger for cotton than for rayon, wool, nylon, or Dacron, the respective diffusion constants being of the order of 134, 56, 39, 8, and 7×10^{-4} cm.^{2}/sec. at R.H. of 54–93%. While the possible influence of air in the lumen of cotton has not been completely evaluated, there is evidence that such influence has been reduced if not eliminated. This same evidence also indicates that the cotton fibres are in part in an altered condition as a result of embedment. Even so, the results suggest that cotton is a good choice of fibre for high water-vapour transmission along the fibre. S.B.D.

Diffusion of Water Vapour through Laminae with particular reference to Textile Fabrics
L. E. MacHattie, A. C. Goodings, and L. H. Thurl

Text. Research J., **27**, 418 (May 1957).

The authors correct a statement in a communication with the above title (*ibid.*, **25**, 197 (1955)). In this paper they give the resistance of an air space in units of thickness of still air as—

$$R = \frac{DAt}{Q}\,(p_a - p_b)$$

Where p_a and p_b are stated to be vapour pressures. In fact p_a and p_b are vapour concentrations. S.B.D.

Technology of Non-woven Fabrics
L. G. Lovin and L. P. Wenzell

Amer. Dyestuff Rep., **46**, P 326–P 328 (6 May 1957)

The advantages of non-woven fabrics are— (i) a means of converting fibres to fabric cheaply, (ii) novel fabrics can be made, and (iii) short fibres, otherwise useless, can be made into fabric. The raw material is opened and blended on conventional machinery. The web can be prepared by laying 2–6 webs on top of each other, by cross-lapping a

garnett web, or by combining these two processes. Another alternative is to "air-lay" the web, the fibres being blown on to a moving condenser screen. Completely random deposition gives equal strength in all directions, and the method can be carefully controlled. Another method is to use a liquid suspension of the fibres. Fibres can be bonded by applying a bonding agent and passing between heated rollers. Thermoplastic fibres can be mixed into the web, or bonding agents can be printed on to it. These processes are also followed by passage between heated rollers. Drying and curing are carried out in conventional apparatus. Non-woven fabrics can be printed, embossed, cut, dyed, and processed in many ways like woven fabrics. Lubricants and softeners reduce fusion and increase seam strength if the fabric is to be cut and sewn. P.T.S.

Binders for Non-woven Fabrics
N. H. Sherwood

Amer. Dyestuff Rep., **46**, P 323–P 325 (6 May 1957)

Binders may be applied in solution, e.g. a benzene solution of rubber. The solvent is evaporated, leaving rubber adhesive between the fibres. The disadvantage of such a process is the risk of fire when the solvent is being evaporated off. Thermoplastic fibres may be mixed in with the web. When the web is passed over heated rollers, the thermoplastic fibres melt and flow to the crossover points of the other fibres in the web, which are thus sealed together on cooling. Thermoplastic or thermosetting powders can be dusted on the web, and act in a similar way when the latter is passed between heated rollers. Water-based emulsions of polyvinyl and polyacrylic derivatives are free from fire risk. Tear strength of non-woven fabrics can be made as high as or higher than that of a woven fabric, weight for weight; but the tensile strength is much lower. A still unsolved problem is discoloration of non-woven fabric binders by heat and light. P.T.S.

Non-woven Fabrics—Chemical and Processing Techniques
J. T. Taylor

Amer. Dyestuff Rep., **46**, P 437–P 442 (17 June 1957)

Of fibres used in non-woven fabrics 90–95% are cotton or viscose rayon. Nylon and secondary cellulose acetate are also used to improve strength and appearance respectively. Acrylic and polyester fibres are used to a lesser extent. The fibres ($\frac{3}{4}$–$1\frac{1}{2}$ in. staple length) are made into webs in various ways, which are described. Synthetic polymeric emulsions are applied by impregnation, foaming, spraying, printing, or from a roller. Drying must be carried out carefully to prevent migration of the bonding emulsion particles. As much as 40–50% of the weight of the fabric may be bonding resin. Choice of bonding agent is governed by the end-use of the fabric. Synthetic-polymer fibres incorporated in webs can be used as bonding agents. Melamine–, ethyleneurea–, and urea–formaldehyde resins may be used. Non-woven fabrics can be made extremely cheaply and at very high speed by papermaking methods. P.T.S.

Effect of Temperature on the Physical and Chemical Development of Cotton Fibre
L. E. Hessler, C. R. Simmons, and H. C. Lane

Text. Research J., **27**, 412–416 (May 1957)

Temperatures below 70°c. restrain the physical and chemical development of cotton in the boll, so that, compared with early pickings, the cotton fibres in late crops are finer, thinner-walled, weaker, and less crystalline, contain less cellulose, and are polymerised to a lower degree. High correlations have been found between adverse temperature conditions during boll development and fineness, lower D.P. and increased dye adsorption of the cotton fibres. S.B.D.

Acid and Alkali Resistance of Partially Acetylated Cotton Fabrics
E. Honold, E. J. Keating, and E. L. Skau

Text. Research J., **27**, 400–411 (May 1957)

Several portions of cotton sheeting are acetylated to various degrees, and sample strips, together with unacetylated controls, are then steeped at two temperatures for different periods of time in selected acid, alkaline, or solvent baths. After routine washing, drying, and conditioning, the values of certain selected properties are determined and recorded graphically. In general, the original acetyl content determines the changes in property values on exposure to acid or alkaline solutions. Under the experimental conditions investigated, deacetylation is negligible in solutions having a pH between 2·4 and 9·2. Outside this range the fabrics of high acetyl content are more resistant to deacetylation than those of low acetyl content. S.B.D.

Divergent Behaviour of the Hydroxides of Lithium and Sodium and of Potassium, Rubidium and Caesium in the Xanthation of Cellulose and Starch
E. G. Adamek and C. B. Purves

Canadian J. Chem., **35**, 960–968 (Sept. 1957)

Alkali cellulose xanthates, prepared by shaking suspensions of cellulose in aqueous soln. of the hydroxides of Li, Na, K, Rb, and Cs in the presence of excess of CS_2, showed a marked difference in the relation between degree of xanthation and concn. of alkali as between the first two and last three hydroxides. With LiOH and NaOH the degree of xanthation rose steadily to ca. 0·4 as the concn. of alkali was increased to 5 N. With KOH, RbOH, and CsOH, degree of xanthation rose rapidly to a max. value of ca. 1·2 in 3 N. alkali falling slowly with further increase in alkali concn. All the metal xanthates from both starch and cellulose could be precipitated by addition of CH_3OH, and the dry salts readily yielded *S*-methylxanthates by reaction with CH_3I with no change in the degree of xanthation. Analysis of the *S*-methyl esters was preferred, since they are much more stable than the alkali-metal salts. A.J.

Molecular Organisation in Keratins
R. D. B. Fraser and T. P. MacRae

I—Introductory Survey

Text. Research J., **27**, 379–384 (May 1957)

The present state of knowledge of the molecular organisation and fine histological detail in keratins is reviewed. Methods of determining crystallinity are critically assessed, and the possible bearing of crystalline content on the occurrence of a structural unit in keratins is discussed.

II—Densities of Native Keratins

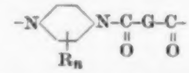
Ibid., 384–390

An apparatus for rapid density determinations is described in which small keratin samples may be dried, and anhydrous solvent subsequently distilled on to them, the density being measured by finding the temperature at which the sample neither floats nor sinks. Densities of a representative series of keratins are reported and used to assess relative crystallinity. The measured densities are compared with those predicted by various models of α-keratin structure. S.B.D.

PATENT

Synthetic Linear Soluble Polymers
Du Pont *BP* 785,214

Synthetic linear soluble polymers and copolymers of m.p. > 275°c. and from which fibres or films can be spun by wet or dry spinning are obtained by condensing piperazine and/or a substituted piperazine with one or more carbocyclic dicarboxylic acids, the carboxyl groups being separated by > 2 atoms. The recurring structural unit in the case of copolymers is of formula—



(R = non-reactive substituent; *n* = 0–8; G = carbocyclic group of > 3 atoms). The safe ironing temperature of these polymers is greater than that of nylon, and the higher m.p. is also useful in the manufacture of tyre-cords, heat-resistant filters, etc. W.G.C.

Soiling Characteristics of Textile Fibres. III—Effect of Twist on Soil Retention (VII p. 65)

Thiols, Disulphides, and Thiosulphates—Some New Reactions and Possibilities in Peptide and Protein Chemistry (XII p. 70)

Photochemistry of Polymer Films (XIII p. 71)

m-Xylylenediamine Polyamide Resins (XIII p. 71)

Reclamation of Fibres from Rags (XIV p. 73)

Applications of Radioactivity in the Textile Industry (XIV p. 76)

VII—DESIZING; SCOURING; CARBONISING; BLEACHING

Adsorption of Sodium Lauryl Sulphate and Lauryl Alcohol at the Air–Liquid Interface
A. Wilson, M. B. Epstein, and J. Ross

J. Colloid Sci., **12**, 345–355 (Aug. 1957)

Measurements have been made of the concentration changes accompanying the formation of large surface areas from solutions of sodium lauryl sulphate. Adsorption increases until the critical micelle concentration is reached, and then remains constant with a surface area of 40 A.^{2} per molecule. In the three-component system sodium lauryl sulphate–lauryl alcohol–water no distinction could be shown for adsorption of lauryl alcohol and sodium lauryl sulphate. Only a monolayer of the two adsorbed components is necessary to give slowly draining films below the transition temperature. W.R.M.

pH Factor in Washing of Hair and Bristles
J. Jezek

Kožařství, **6**, 122–124 (1956): *J. Amer. Leather Chem. Assocn.*, **52**, 520 (Sept. 1957)

The following procedure is recommended for use in textile factories— wash for 15 min. at 50–60°C. in Na_2CO_3 soln. at pH 9·5–10, with the addition of K soap or sulphated higher alcohols. Add a CCl_4 emulsion before the end of the wash. Drain, wash the bristles with water, and acidify to pH 4–5 with H·COOH. Bleach with H_2O_2 + NH_4OH, with pH stabilised at 7·5–8·0 with Na_2SiO_3, and follow with a reduction bleach with Rongalite ($NaHSO_2$·CH(OH),$2H_2O$). C.J.W.H.

Oxidation of Silk Fibroin by Hydrogen Peroxide and by Peracetic Acid
D. A. Sitch and S. G. Smith

J. Textile Inst., **48**, T 341–T 355 (Sept. 1957)

An oxidising agent can attack a protein in three ways— (i) oxidation of the side-chains of certain amino acids, (ii) oxidation at the *N*-terminal residue of a protein chain, and (iii) scission of peptide bonds of the main chain. Reactions (ii) and (iii) are influenced by the amino-acid side-chains. The extent of the degradation of silk fibroin by hydrogen peroxide and peracetic acid was assessed by measurement of the changes of the fluidity of a solution of the fibroin in cupriethylenediamine and losses in weight. Changes in the base-binding capacity were measured by Methylene Blue absorption, and the oxidation of the phenolic group of tyrosine was followed. Peracetic acid causes more rapid main-chain scission than hydrogen peroxide, but the loss in weight for a given increase in fluidity is greater with hydrogen peroxide. For a given change in fluidity, peracetic acid is more effective in oxidising the tyrosine side-chains. Peracetic acid produces more acidic groups than hydrogen peroxide. For fibroin oxidised by peracetic acid the curve of increase of Methylene Blue absorption against fall in tyrosine content is a straight line, thus supporting the view that tyrosine side-chains are oxidised to acidic groups. P.T.S.

Soiling Characteristics of Textile Fibres. III— Effect of Twist on Soil Retention
A. S. Weatherburn and C. H. Bayley

Text. Research J., **27**, 358–361 (May 1957)

The effect of twist on soil retention has been studied for a series of cellulose acetate yarns. With increasing twist, the soil retention first increased to a maximum, and then decreased to values below that of the untwisted yarn. Microscopic examination of the soiled yarn indicated that at 20 t.p.in. visible soil particles had penetrated to the centre of the yarn, whereas at 60 t.p.in. the soil was located on the exterior only. S.B.D.

Dirt Removal from Cotton
R. E. Wagg and C. J. Britt

Nature, **180**, 48 (6 July 1957)

The relative efficiencies of various detergents showed marked similarities whether measured by removal of graphite (as determined by change in reflectance) or of radioactive stearic acid from a soiling mixture applied to cotton fibres. Even in the presence of excess of strong alkali, the removal of stearic acid depended partly upon the detergent used. W.K.R.

Reaction of Chlorine Dioxide and a Lignosulphonic Acid
D. M. Smith and C. B. Purves

Ind. Eng. Chem., **49**, 1394 (Sept. 1957)

A lignosulphonic acid isolated from spruce wood was oxidised by chlorine dioxide. The presence of two types of sulpho groups in the lignosulphonic acid was noted. Approximately half the sulpho groups were removed as sulphuric acid, not as the expected low-mol.wt. aliphatic sulphonic acids. The others were retained in a complex mixture of oxylignosulphonic acids, about 20% of which could not be dialysed through Cellophane. The ultraviolet absorption maximum at 280 mμ., characteristic of unoxidised lignosulphonic acids, was eliminated. W.K.R.

Laundry Bleach (III p. 50)
Action of Chlorous Acid on Hydrocelluloses (XI p. 70)

VIII—DYEING

Dyeing of Coarse Medulla-containing Fibres in Wool Blends
G. Nitschke

Faserforsch. und Textiltech., **8**, 330–339 (Aug. 1957)

The connection between the thickness of the medullary region and the dyeing behaviour of the fibre is studied with particular reference to the effects of various wool-dyeing processes on the depth of penetration into the fibre, the rate of exhaustion and fastness of dye, using wool, beard, and dead hairs. The swelling of single hairs in blank dye liquors is considered. W.R.M.

Dyeing Assistant for Chrome-complex Dyes. I— Application of Polyoxyethylene Alkyl Ethers
M. Miguno, Y. Nemoto, A. Nagata, and H. Tajimi

Abura Kagaku, **5**, 271–174 (1956): *Chem. Abs.*, **51**, 11721 (10 Aug. 1957)

A range of nonionic surfactants was prepared from dodecyl, 9-octadecyl or octadecyl alcohol with 10–31 mol. of ethylene oxide. Their effect in dyeing with Neolan Black WA, Palatine Fast Pink BN and Palatine Fast Blue GGN showed that the octadecyl ether with 31 mol. ethylene oxide gave the nearest results to those obtained using Palatine Fast Salt highly conc. C.O.C.

Importance of the Infrared Properties of Colouring Matters for Military Requirements
E. Ganz

Textil-Rund., **12**, 425–432 (Aug. 1957); *Teintex*, **22**, 661–673 (Sept. 1957)

The infrared reflectance characteristics are an important factor in camouflage and its detection by infrared photography or other means. On cotton, vat and sulphur dyes are the most satisfactory; but wool presents a more difficult problem, which is best overcome by admixture of other fibres of stronger infrared absorption. S.R.C.

Graphical Aids to Quantitative Reflectance Spectrophotometry of Dyeings
A. Darbey

Amer. Dyestuff Rep., **46**, 465–471 (1 July 1957)

Wool samples are dyed with three dyes. Reflectance from the cloth is measured with a Beckman spectrophotometer. A function of this reflectance is plotted against the wavelength. The determinations are repeated using different dye concentrations on the wool. From these curves it is possible by trial-and-error methods to estimate the proportion of each dye when a wool sample is dyed with a mixture of the three dyes. Thus matching is facilitated. Other graphical procedures having the same object are described. P.T.S.

Recent Developments in Vat Dyeing
J. M. Fletcher

Amer. Dyestuff Rep., **46**, P 319–P 322 and P 328 (6 May 1957)

A general article covering the last ten years. The du Pont pad-steam continuous dyeing process, the Williams unit (liquid instead of steam development), the du Pont Savagraph water-in-oil emulsion printing process, high-temperature package dyeing, dyeing of cotton socks and knitted goods, the pad dyeing of carpets, and the du Pont Flowstock Process for the continuous dyeing of cotton or rayon staple, which is being developed in the laboratory and should be applicable to wool and nylon,

are described. In this last process the stock dwells for 1 min. in a tube through which dye is circulated. The stock is squeezed, sprayed with water, squeezed, and dried. Stock, dye, and chemicals are added continuously to maintain equilibrium. P.T.S.

Dyeing Blends of Dacron Polyester Fibre and Cotton
J. J. Iannarone, P. L. Speakman, O. S. Larson, R. C. Hurt, and E. H. Hinton

Amer. Dyestuff. Rep., **46**, P 674–P 679 (9 Sept. 1957)

Pastel colours can be obtained economically by dyeing only the cotton with insoluble or soluble vat dyes by continuous processes. For light or medium depths, the Dacron can be dyed with disperse dyes by the Thermosol process— the fabric is padded at 120°F. partially dried to retain 25% moisture, and treated at 400–450°F. for 15–60 sec. Only dyes showing minimum vaporisation should be used in the Thermosol process. Suitable dye mixtures for cotton–Dacron blends are given, and also full details of the procedures. P.T.S.

Mechanism of Carrier Action in Dyeing Dacron Polyester Fibre
M. J. Schuler

Text. Research J., **27**, 352–358 (May 1957)

The effect of carriers on the rate of dyeing of Dacron polyester fibre in a non-aqueous system (*iso*octane) is examined in a special apparatus which enables the dye concentration in the bath to be found by spectrophotometry, and sampling of the fibre to be made through a port. The carrier is added first, and brought to equilibrium on the fibre at about 0·3 molal concentration before introduction of the dye. The rate of dyeing is relatively independent of the type of carrier, so that, despite differences in functionality, it is concluded that the mechanism of action is substantially the same for all carriers. This mechanism appears to be the loosening of polymer interchain forces with a resulting increase in the diffusion rates of both the carrier and the dye. The same mechanism is thought to apply with only slight modifications to simultaneous application of carrier and dye in aqueous systems. S.B.D.

Dyeing of Orlon Acrylic Fibre with Cationic Dyes
J. P. Neary and R. J. Thomas

Amer. Dyestuff Rep., **46**, P 625–P 633 (26 Aug. 1957)

A new type of Orlon is more susceptible to cationic dyeing. Details of detergents, levellers, retarders, and stripping agents are given together with conditions of temperature and pH suitable for dyeing. Practical details of the dyeing of raw stock, tow, tops, yarns, fabrics, and hose and sweaters follow. Blends with Orlon can be used for resist effects. For light to medium depths in a wool–Orlon blend, cationic and neutral-dyeing metal-complex dyes can be used simultaneously. For medium and heavy depths cationic and selected acid dyes are used simultaneously. With blends containing cellulosic fibres, cationic and basic or disperse dyes are applied to the Orlon, and direct dyes to e.g. rayon. Resin treatment gives fastness to washing. For better fastness vat dyes are used on the cellulosic component. For pale colours a single process will dye both fibres. For darker colours two separate dyeings are better. Appendixes give suitable dye mixtures for 100% Orlon and blends with wool and rayon. P.T.S.

Interaction of Oxidation Bases and Oxidising Agents in Fur Dyeing
P. I. Chatskiĭ

Legkaya Prom., **16**, (12), 30–34 (1956): *Chem. Abs.*, **51**, 13443 (10 Sept. 1957)

According to accepted theory the dyeing of fur mordanted with dichromic acid results from simultaneous interaction of H_2O_2 and the acid in the oxidation base, e.g. *p*-phenylenediamine. Unsatisfactory results ensue if the oxidation base is prematurely oxidised by the rapid action of perchromic acid formed from the H_2O_2 and the dichromate adsorbed on the hair surface. Controlled experiments suggest that the H_2O_2 should be added not earlier than 30 min. after the beginning of dyeing. In that case the chromic acid is given time to exert its oxidising action before it is attacked by the H_2O_2, both oxidation base and the acids are conserved for useful work, the correct pH is more readily maintained, and mordanting and dyeing better controlled. C.O.C.

PATENTS

Dyeing Peroxide-bleached Wool
Food Machinery & Chemical Corpn. *USP* 2,739,868

On dyeing batches of peroxide bleached wool closer matching between batches is obtained if the wool is treated between bleaching and dyeing with a quantity of a reducing agent insufficient to cause any visual bleaching action, e.g. by treating in 0·1% $NaHSO_3$ for 3 min. at room temperature using a liquor ratio of 50 : 1. C.O.C.

Dyeings of Excellent Fastness to Potting
Ciba *BP* 783,622

Wool dyed from a weakly alkaline, neutral or weakly acid bath with a 1 : 2 metal complex of a monoazo dye containing no sulphonic acid groups, but preferably containing a sulphone or sulphonic acid amide group is very fast to potting if the potting is carried out in an acid bath. C.O.C.

Aftertreatment of Azoic Dyeings on Cellulose Derivatives
General Aniline *USP* 2,742,341

Azoic dyeings on cellulose derivatives are brought to their true hue and given good fastness to light by treating them for 3–40 min. at 120–190°F. in a 0·5–10·0% aqueous solution of a polar organic swelling agent for the cellulose derivative using a liquor ratio of 10–40 : 1. Suitable swelling agents are 7% by weight of phthalic anhydride in a water-soluble phenol, ethylene glycol monobutyl ether, furfuryl, pyridine or epichlorohydrin. C.O.C.

Gas-fume Fading Inhibitors
BASF *BP* 780,764

Colourless compounds containing at least one amino group and at least one keto and/or etherified hydroxyl or thiol group and/or at least one hydroxyl group esterified with a monocarboxylic acid or with a mono- or di-*iso*cyanate are used. The keto, ether and/or ester groups are linked in the β- or γ-position to the amino groups by an open-chain saturated alkylene group. The formaldehyde-bisulphite derivatives of these compounds may also be used. Thus *NN'*-bis-(2-benzoyloxyethyl)-piperazine is added to the bath when dyeing acetate rayon with 1:4:5:8-tetraminoanthraquinone. This yields blue dyeings of very good fastness to gas fume fading. 35 other examples are given. C.O.C.

Increasing the Affinity of Synthetic Fibres for Dyes
N. V. de Bataafsche Petroleum *BP* 780,288

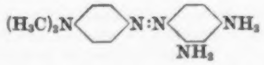
Polyacrylic, polyester, polyamide, polyvinyl, polyvinylidene, protein and cellulose ester fibres when treated with an aqueous solution or dispersion of a polyepoxide and an amine catalyst and then baked are given improved affinity for all conventional dyes and pigments. Such treated material dyes levelly and the dyeings have excellent fastness to washing and weathering. Fabrics treated in this manner do not fray when cut and those made from polyester fibres have less tendency to pill. C.O.C.

Dyeing Nitrogenous Fibrous Material
Ciba *BP* 783,610

Very satisfactory dyeing is obtained by use in a weakly alkaline to weakly acid bath of a metalliferous dye containing one atom of metal bound in complex union to two molecules of different monoazo dyes. Both dyes contain no carboxy group other than in *ortho*-position to the azo group while one contains no sulphonic acid group and the other only one sulphonic acid group. An example of such a complex dye is the blue 1 : 2 chromium complex of the dyes 1 - amino - 2 - hydroxynaphthalene - 4 - sulphonic acid→8 - chloro-1-oxynaphthalene and 2-amino-1-hydroxybenzene-5-sulphonic acid amide→5 : 8-dichloro-1-hydroxynaphthalene. C.O.C.

Dyeing or Printing Polyacrylonitrile Fibres
Ciba *BP* 783,443

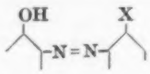
2':4'-Diamino-1:1'-azobenzenes free from acid groups imparting solubility in water and containing a tertiary amino group in the 4-position are used either as their salts with any desired acid for dyeing or printing polyacrylonitrile fibres or else the fibres are treated either with the dye or acid first and then with the acid or dye as necessary. Thus a full black fast to washing and light is obtained by dyeing the fibres with the dye—



and then treating in an aqueous bath containing NH_4CNS, $K_2Cr_2O_7$ and H_2SO_4. C.O.C.

Dyeing of Polyacrylonitrile
S *BP* 782,775

Modification of *BP* 696,984 (J.S.D.C., **69**, 471 (1953)) and *BP* 767,053 (J.S.D.C., **73**, 279 (June 1957)). Polymers or copolymers of acrylonitrile are dyed with acid *mono*-azo dyes containing $\nless$ 1 SO_3H and a metallisable group—



(X = OH, COOH or NH_2) or the Cu or Ni complexes of such dyes. Dyeing is carried out at pH 2 to 7 at 90–130°C. in the presence of cuprous ion, the latter condition being achieved by addition of a soluble cupric salt to the dyebath in the presence of metallic copper in the form of sheet, cuttings, wire or gauze. Then $Cu^{++} + Cu \rightleftharpoons 2\,Cu^{+}$. Glucose or saccharose may be added to protect the dye from deterioration due to atmospheric oxygen but they do not act as reducing agents for the cupric ion under the acidic conditions used. E.T.

Dyeing Polyacrylic Fibres
Chemstrand Corpn. *USP* 2,740,687

Deeper and better penetrated dyeings are obtained with acid dyes if in addition to the acid there is also present a vinyl substituted tertiary amine or a salt thereof soluble in the acid, e.g. *N*-vinylimidazole, vinylpyridine, vinylquinoline, vinylmercaptobenzothiazole or their salts. C.O.C.

Dyed Crimped Yarns of Synthetic Fibres
Heberlein & Co. *BP* 780,227

The yarn is impregnated with dye liquor, then highly twisted and finally treated with hot gas or steam thus both fixing the dye and setting the twist. Even dyeing is obtained. C.O.C.

Colouring Polymeric Esters or Ethers
Celanese Corpn. of America *BP* 779,219

Fast colorations are obtained by treating the film or other article with a solution of a dye and a monocyclic *NN'*-bis-(alkoxymethyl)-urea or -thiourea, e.g. *NN'*-bis-(methoxymethyl)-ethylene urea, in an organic solvent. Heating the coloured material in presence of an acidic catalyst improves the fastness to solvents and washing with soap solution. C.O.C.

Colouring Citrus Fruits
Commonwealth Engineering Co. *USP* 2,739,897

A continuous process of washing the fruit and colouring them by applying the natural pigments extracted from the peel of mature and ripe fruit. C.O.C.

Dyeing with Insoluble Basic Phthalocyanine Dyes
FBy *BP* 784,844

Dyeings of excellent wet fastness are produced without aftertreatment on wool, cotton, regenerated cellulose, polyamide, polyacryl and paper fibres by use of water-insoluble basic phthalocyanine dyes having 1–4 radicals of formula—

$$-\underset{\substack{|\\R^1}}{N}-R^2-N\begin{matrix}\diagup R^3\\ \diagdown R^4\end{matrix}$$

(R^1 = H or Alk; R^2 = acyclic bivalent radical; R^3 and R^4 = aliphatic radicals). Dyeing takes place from dilute acetic or formic acid solutions in which the dyes are soluble and complete exhaustion is generally achieved. E.T.

Hair Dyes
Société Monsavon-l'Oreal *BP* 785,725

Hair is dyed at room temperature by treatment with an anionic dye, an activation product in equimolecular proportion so as to neutralise the dye, and just enough of a nonionic solubilising agent to bring the anion–cation complex into solution. Thus white hair is tinted pale blue by a mixture of Chlorantine Fast Blue GLL (C.I. Direct Blue 71) (2 g.), Lissolamine A (0·5), Cémusol 132 (1·1), lactic acid (2·5) and water (to bring to 100). C.O.C.

Silver Salts as Hair Dyes
Ashe Chemical *BP* 784,542

A mixture of a silver salt and *p*-aminosalicylic acid is stable in solution in absence of heat, light and air but on warming or exposure to light or air the *p*-aminosalicylic acid decomposes to yield products which reduce the silver salt. Such solutions are used as hair dyes. Increase in the amount of *p*-aminosalicylic acid used increases, within limits, the speed of dyeing and modifies the hue obtained, smaller quantities yielding blue-blacks, larger quantities browns and still larger quantities reddish browns. C.O.C.

Improving the Dyeing Properties of Nylon
Heyden Chemical Corpn. *USP* 2,743,231

Nylon treated with aqueous solutions, e.g. 0·5% by wt., of either 5-chlorosalicylic acid or cresotinic acid, yields much deeper dyeings with most dyes in absence of carriers than does untreated nylon in presence of carriers. C.O.C.

Dyeing Acrylic Fibres
Union Carbide & Carbon Corpn. *USP* 2,743,991–3

Deep dyeings are readily obtained on acrylic fibres with direct and acid dyes from an acid bath containing copper some at least of which is in the cuprous form. The dyeings are fast to light and rubbing. Best results are obtained when the cuprous ions are gradually formed *in situ* in the dyebath. C.O.C.

Monoazo Reactive Dyes (IV p. 55)
Metal-free Phthalocyanine or its Derivatives for Dyeing Cellulose (IV p. 57)
Oxidation Colouring Matters (IV p. 61)
Ban-Lon (VI p. 63)
Dyeing of Glove Leather (XII p. 70)
Applications of Radioactivity in the Textile Industry (XIV p. 76)

IX—PRINTING

Mechanism of Supersensitisation
G. Scheibe, R. Brünner, A. E. Oberth, and G. Pick
Sci. et Inds. phot., **28**, 247–248 (1957): *Chem. Abs.*, **51**, 11136 (10 Aug. 1957)

Evidence which supports the theory that supersensitising dyes increase the probability of energy transfer to the Ag halide. C.O.C.

Desensitising Action of Dyes on Emulsions with and without Chemical Sensitising
H. Sauvenier
Sci. et Indus. phot., **28**, 265–269 (1957)

Sensitometric study of the effect of phenosafranine (I) and Pinakryptol Yellow (II) in AgBr emulsion prepared with inert gelatin and subjected to various types of chemical sensitising. That I and II have a greater effect on reduction-sensitised AgBr than on other sensitisation types is explained by oxidation of Ag sensitivity nuclei. Chemical sensitising can affect adsorption of the desensitiser, both as to amount and preferred adsorption sites, by changing surface conditions of the AgBr. C.O.C.

PATENTS

Transfer Sheets for Spirit Duplication
A. B. Dick Co. *USP* 2,743,191

The transfer sheet contains a component or the components for a dye which is however not produced except by reaction in the copy sheets. Thus the transfer sheet is impregnated with a mixture in a wax base of *p*-diazodiethylaniline zinc chloride and 1-amino-8-naphthol-4-sulphonic acid. A master copy made from the transfer sheet, e.g. by typing, is then contacted with copy sheets dampened with an alcoholic solution of phloroglucinol, *β*-naphthol, and diethanolamine. This transfers some of the mixture of the dye components to the copy sheets where they react to form the dye. C.O.C.

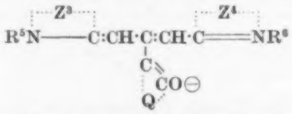
Mixtures of Ionised and Non-ionised Dyes as Photographic Sensitisers
Kodak *BP* 784,451

A mixture of a dye of formula—

$$R^1\overset{Z^1}{\overbrace{N\text{——}C}}{:}CH{\cdot}C(NR^3R^4){:}CH{\cdot}\overset{Z^2}{\overbrace{C\text{===}N}}XR^2$$

(R^1 and R^2 = subst. or unsubst. Alk; X = acid radical;

Z^1 and Z^2 = atoms to complete benzothiazole or naphthothiazole nuclei; R^3 = H, subst. or unsubst. Alk or acyl; R^4 = H, Alk or *cyclo*Alk or Ar or (when R^3 = H) OH, arylamino or acylarylamino; R^3 and R^4 together = atoms to complete a 1-piperidyl or 4-morpholinyl group), and a non-ionised dye of formula—



(R^5 and R^6 = Alk; Q = atoms to complete an indanedione or 5- or 6-membered heterocyclic nucleus; Z^3 = atoms to complete a benzothiazole, naphthothiazole, benzoselenazole, naphthoselenazole or naphthoxazole nucleus; Z^4 = atoms to complete a naphthothiazole or naphthothiazole nucleus), e.g. a mixture of 9-anilino-3:3′-dimethylthiacarbocyanine *p*-toluenesulphonate and 1:3-diethyl-5-[di(1-ethyl-2-β-naphthothiazolylidene)*iso*propylidene]-barbituric acid, is an excellent photographic supersensitiser. C.O.C.

Mechanism of Dye Formation in Colour Photography (IV p. 50)
Dyeing or Printing Polyacrylonitrile Fibres (VIII p. 66)

X—SIZING AND FINISHING

Back-sizing of Carpets
H. R. Crone
J. Textile Inst., **48**, P 404–P 415 (July 1957)

In back-sizing, stiffening materials, usually starches, are applied mechanically to the back of carpets. Back-sizing stiffens the carpet, gives bulk, and makes a contribution to tuft anchorage. Modern starches have the advantage of reproducibility. Methods of preparation, application, and drying are given. Rubber latex and synthetic-resin backings have certain advantages, the former for non-slip backings on rugs, and the latter mixed with starches to lower the cost and improve permanency. P.T.S.

Automatic Control in the Application of Sizing and Finishing Substances in Continuous Wet Processing
E. H. Jones
J. Textile Inst., **48**, P 569–P 590 (Sept. 1957)

In the new control methods described in this paper a stock liquor of size or finish is prepared of known concentration. It is metered out to the bath or other applicator at such a rate that the substance arrives at the bath at the rate at which it is desired that it should be taken up by the moving material. Means are then provided for detecting changes in the weight or volume of the bath, and if it is changing the change is used to adjust automatically some factor affecting the take-up of the substance by the material. The adjustable factor may be either the concentration of the substance in the bath or some condition imposed by the machine. The mathematical theory of both cases is given, and there are diagrams of both systems. P.T.S.

Mechanism of Drying of Thick Porous Bodies during the Falling-rate Period
A. H. Nissen and W. G. Kaye
Nature, **180**, 142–143 (20 July 1957)

Temperatures of different layers in a thick porous bobbin of Terylene have been determined during drying. Initially, all layers approach the wet-bulb temperature of the air. At the end of the constant-rate-of-drying period the temperature of the surface layer rises steeply to the dry-bulb temperature of the air. The temperatures of all other layers rise to a pseudo wet-bulb temperature and then increase after different times depending on their distance from the surface of the bobbin. A mechanism to account for these observations is proposed in terms of evaporation of water vapour into moving or stagnant air. W.R.M.

Chemical Mechanism of Permanent Set
R. S. Asquith, J. B. Speakman, and E. Tolgyesi
Nature, **180**, 502 (7 Sept. 1957)

Setting of strained wool fibres in a boiling 2% solution of borax is believed to involve reaction between sulphenic acid and basic side-chains. Set fibres contain fewer lysine side-chains. Setting of strained wool by treatment with boiling sodium bisulphite solution involves a different mechanism. The lysine content is unaltered and it is suggested that the rebuilding of disulphide bonds occurs. W.R.M.

Acid Control in Feltmaking
T. Barr and G. McLeavy
J. Textile Inst., **48**, P 615–P 636 (Sept. 1957)

A survey of factories making wool and fur felts showed that the products from such factories varied widely and unpredictably in their acid contents. The acid content of felts is important because it affects dyeing properties and, in the hat industry, the shellac proofing process. Acid can be controlled by the equilibrium method, which is based on the fact that the amount of acid absorbed by wool depends on the final pH of the acid solution in which it is placed. Equilibrium is attained in 24 hr. Alternatively, the standard-conditions method can be used. Here the material is treated with acid for a definite time at an elevated temperature. Equilibrium is not attained, but the acid content of the felt should be the same for the same conditions of acid concentration, time, and temperature. Details of the factory survey are given together with descriptions of the application of the above principles to factory conditions. P.T.S.

Action of Heat on Wool
J. Martin and J. B. Speakman
Chem. and Ind., 955 (6 July 1957)

Wool treated with maleic anhydride gives a fabric which, after being heated in dry nitrogen at 150°C. for 24 hr., has much lower alkali and urea-bisulphite solubility than untreated wool. Comparison of results for maleic and succinic anhydrides suggests that the protective action of the former is due to the formation of addition compounds, and therefore new cross-links, with thiols derived from thermal breakdown of disulphide bonds. W.R.M.

Shrinkproofing Treatments
F. C. Mauri
Ingen. text., **24**, 117–125 (March–April); 312–320 (July–Aug. 1957)

The subject is discussed and the relevant patents quoted under the following headings—mechanical (abrasives and ultrasonics), enzymatic (Perzyme, Chlorzyme), alkaline (Freney–Lipson, Epilox), reduction (reduction–alkylation, reduction–oxidation), oxidation (peroxides, per acids, permanganate, Lanfix, Stevenson). S.R.C.

Improvement of Heat Endurance of Cotton by Treatment with Dicyandiamide
W. G. Sloan and E. M. Buras
Amer. Dyestuff Rep., **46**, P 529–P 532 (29 July 1957)

Dicyandiamide can be padded on to cotton as an aqueous solution, or the cotton can be soaked in the solution and centrifuged to the required weight increase. On drying, the heat endurance (measured by breaking strength and tear tests after heat-treatment) of grey, dyed, and resin-treated cotton is increased 100%. Scoured cotton fabrics are improved 50%; the results with partially acetylated cotton vary with the initial heat endurance of the fabric. There is slight improvement of the heat endurance of cyanoethylated cotton yarn and secondary cellulose acetate yarn, and a slight diminution of the heat endurance of aminised cotton yarn and viscose rayon yarn, after dicyandiamide treatment. The finish is not fast to washing. P.T.S.

Condensation of Urea–Formaldehyde Resins in Cellulosic Materials
R. Loss
Textil-Rund., **12**, 502–507 (Sept. 1957)

The formation of the precursor can be followed by viscosity or temperature measurements. Both give the same end-point. The precursor must be stored cold. The type of catalyst, moisture content, and temperature greatly influence the condensation process, and for regularity these factors must be held constant. This is ideally carried out automatically. S.R.C.

Theoretical and Practical Aspects of the Use of Resins for Crease-resistance
J. T. Marsh
Textil-Rund., **12**, 485–494 (Sept. 1957)

The natures of potential resins–: phenol–, urea–, melamine–formaldehyde, cyclic ureas, and epoxy resins

are discussed with distinction drawn between cross-linking effects and polymer formation. Eponite 100 is partially soluble in water and gives predominantly a cross-linking effect. Substantial embrittlement is caused by epoxy resins, but their main interest lies in complete freedom from chlorine retention. The need for strict control of the quality of resin finishes is stressed, and trade-names associated with such control enable the general public to purchase confidently. S.R.C.

Tear Strength of Fabrics
R. Steele
Amer. Dyestuff Rep., **46**, 329–335 (6 May 1957)
Tear resistance depends on two factors— tensile behaviour and fabric deformability— which appear to be independent. The tongue tear test is sensitive to deformability; the Elmendorf test is less sensitive; and the trapezoid test is relatively insensitive. These three test methods are equally sensitive to tensile behaviour. Quaternary ammonium surface lubricants increase fabric deformability, but they have only a slight effect on tensile behaviour. Urea-formaldehyde finishes affect tear resistance by changing the tensile strength and the elongation possible without fibre breakage. Surface resins affect tear strength via fibre-to-fibre interactions. P.T.S.

Application of Fluoro-chemicals to Cotton Fabrics to obtain Oil- and Water-repellent Surfaces
F. J. Philips, L. Segal, and L. Loeb
Text. Research J., **27**, 369–378 (May 1957)
Commercial and laboratory preparations of poly-(fluoroalkyl esters of acrylic acid) and of chromium complexes of fluorine-containing monocarboxylic acids have been used to treat cotton fabrics, thereby substituting low-energy $-CF_3$ and $>CF_2$ groups for the –H, –OH, and $-CH_2OH$ of the cellulose surface of the cotton fibres. Data are presented to show the relative effectiveness of several classes of fluorocarbon compounds as satisfactory repellency treatments for cotton fabrics, and that modification of the fabric surfaces by the use of perfluorocarbon compounds considerably improves the resistance of the fabrics to wetting, not only by water but also by organic liquids of low surface tension. S.B.D.

2:2′-Dihydroxy-5:5′-dichlorodiphenylmethane as a Textile Fungicide
G. R. F. Rose, M. E. Fraser, and C. H. Bayley
Amer. Dyestuff Rep., **46**, 385–390 (3 June 1957)
Fungicides are often coloured (copper compounds), odorous (zinc naphthenate), or poisonous (mercurials). 2:2′-Dihydroxy-5:5′-dichlorodiphenylmethane (I) has none of these disadvantages. Tested on cotton, using a Scott Tensile Tester, fluidity tests in cuprammonium, and tests to determine leaching in tap-waters at various pH values, the fungicide did not accelerate chemical degradation under normal exposure conditions, and was leached out faster under alkaline conditions. Sunlight slowly decomposes the compound. Ultraviolet radiation causes I to decompose, and in the absence of water HCl is liberated and may attack cotton. 0·5–1·0% of I on cotton gives a level of protection equal to that of other organic fungicides. Details of soil-burial and exposure tests are given. The amount of I leached out under various conditions is estimated from the loss in fungicidal strength. P.T.S.

Rotproofing of Jute by Treatment with Soluble Copper Salts
W. G. Macmillan, S. N. Basu, and P. N. Pal
J. Sci. Ind. Research (India), **16A**, 135–137 (1957): *Chem. Abs.*, **51**, 13401 (10 Sept. 1957)
The rot-resistance of jute is improved by boiling it with aq. $CuSO_4$ or $Cu(CH_3COO)_2$. A high percentage of Cu is retained by the jute even after leaching. Probably the Cu has reacted with the non-cellulosic constituents of the jute as only traces of Cu are retained when cotton is similarly treated. C.O.C.

PATENTS

Water-repellent Finish
Wacker Chemie *USP* 2,789,956
When applying silicone finishes to textiles better and more durable water-repellency is obtained and the temperature of baking can be lowered if the textiles are treated before, during or after the application of the silicone with an aqueous solution of a zirconium compound having affinity for the fibres, e.g. zirconyl chloride, acetate or nitrate. C.O.C.

Imparting Dimensional Stability and Durable Mechanical Effects
Quaker Chemical Products Corpn. *BP* 780,043
Cellulosic materials are treated with non-volatile acetals of mono- and dialdehydes of $<$ 9 C and baked in presence of an acid catalyst at $\nless$ 121°c. Thus a spun viscose shirting is treated with an aqueous solution of di(2-methoxy ethoxyethyl)formal containing $NaHSO_4$ as catalyst, dried at 100°c. and baked for 5 min. at 157°c. C.O.C.

Treating Textiles with a Poly(chloromethyl) Ether of a Polyhydric Alcohol
Etablissements Schaeffer & Cie. *BP* 783,382
The poly(chloromethyl) ethers of polyhydric alcohols react with animal or vegetable fibres to form cross links between the molecular chains of the fibres. The effect can be increased and the handle of the treated textile modified by simultaneously applying a compound containing a labile H atom. Thus cotton or spun viscose rayon fabric is impregnated with an aqueous solution containing the pyridinium salt of glycerol tri(chloromethyl) ether, polyoxyethylated fatty alcohol, and Na acetate, dried at 60–65°c., baked at 140°c. for 5 min., washed and dried. The finished fabric has a woolly handle, much improved resistance to abrasion and dimensional stability to repeated washes at the boil. C.O.C.

Crêped Fabric
Société Rhodiaceta *USP* 2,740,183
Fabric woven from vinyl polymer yarn of $>$ 1500 t.p.i., the twist in which has been set without suppressing the contractibility, on being heated becomes crêped. C.O.C.

Durable Pleats
Joseph Bancroft & Sons Ltd. *BP* 779,423
Pleated fabric is carried in absence of tension on a travelling support through a horizontal chamber where hot gas is circulated over and through the fabric. The support should have an open construction, e.g. be made of wire mesh. The hot gas is admitted into the chamber under moderate pressure and is withdrawn from it through a closed system thereby facilitating flow of the gas over and through the fabric. C.O.C.

Water-repellent Coatings for Fibrous Materials
Ciba *BP* 783,752
A preparation comprising (*a*) an organic solvent solution of a flexible copolymer of an alkyl acrylate or methacrylate and a vinyl ester of a low mol.wt. fatty acid, (*b*) an alkyl ether of a urea- or melamine-formaldehyde condensate which is soluble in the organic solvent, and (*c*) a waxy water-repellent, is applied and then hardened *in situ* by baking. Thus nylon fabric is coated with a composition made up of (*a*) copolymer of vinyl acetate and *n*-butyl acrylate (1 : 1) dissolved in ethyl acetate in presence of a trace of benzoyl peroxide, (*b*) a concentrated solution of a butanol-etherified melamine-formaldehyde in butanol, and (*c*) a hard paraffin wax dissolved in methyl benzene, dried at 80–100°c. and baked for 5–10 min. at 120–130°c. and finally calendered under high pressure. The resulting "oiled" fabric does not become sticky or lose its coating when washed with soap at 50°c. C.O.C.

Coating Fabrics
Dualoy *USP* 2,739,919
A coating which is completely impervious to water, smooth, and resilient, and can have small thickness with any desired handle, is produced by first casting a thin film of any suitable coating material on a smooth carrier. An adhesive or binder is then applied to the cast film and the fabric then rolled with a minimum of warping tension into the adhesive surface. The carrier sheet is then stripped from the coating. C.O.C.

Coating Fabrics
Britona Chemicals *BP* 780,244
A synthetic resin is formed into a plastisol dispersion in a plasticiser. The plasticiser is not a solvent for the resin at room temperature but will dissolve it on heating without the assistance of a volatile solvent. Several films of the dispersion are cast upon each other, each film being at least partially cured before the next film is cast on it. The cloth to be coated is then placed on the last film before it is cured and the whole baked to cause the

resin to dissolve in the plasticiser, cure the film and bond it to the fabric. There is no appreciable penetration of the film into the fabric. C.O.C.

Pile Fabric
United States Rubber Co. *BP* 780,048

A flat fabric is woven with a warp or weft of thermoplastic fibres capable of shrinking 30–60% on subsequent treatment, e.g. when heated. When these fibres shrink they cause the weft or warp, as the case may be, of non-contractile fibres to form into a looped pile. After shrinking the cloth is backsized with rubber or resin to anchor the pile. C.O.C.

Hardening Varnish Coatings on Leather, Cloth or the like
E. Demme *USP* 2,741,566

Overdried patent leather or the like coated with a linseed oil varnish is treated with an *iso*cyanate vapour to harden it. The time of treatment with the vapour is much shortened by first irradiating the coated material with ultraviolet radiation. C.O.C.

Permanent Waving
Unilever *BP* 780,037

A mixture of a mercaptan, a sulphite and formamide or substituted formamide is a very efficient reducing agent for use in permanent waving and the amount of mercaptan present may be much less than that used in other known processes. C.O.C.

Yarn Sizing
Deering Milliken Research Corpn. *USP* 2,743,194

Use of an aqueous solution of a partially hydrolysed poly(vinylacetate) containing $\not<$ 35% of a water-soluble volatile aliphatic alcohol renders drying unnecessary after sizing as swelling and stretching of the yarn is completely inhibited. C.O.C.

Size for Organic Esters of Cellulose
Eastman Kodak Co. *USP* 2,743,193

Cellulose acetate fibres treated with lubricants containing salts of morpholine and lauryl phosphoric acid partial esters have unexpectedly high resistance to abrasion when sized with gelatin or maleic anhydride–styrene copolymers. C.O.C.

Treating Cellulose with 2-Chloroethylphosphates to impart Flame Resistance
U.S. Secretary of Agriculture *USP* 2,743,232

When cellulosic material containing OH groups is treated with an aqueous solution of an alkali metal salt of 2 chloroethylphosphoric acid and alkali metal hydroxide at a suitable temperature the hydroxyl groups of the fibre are converted to 2-phosphatoethyl groups ($-OCH_2CH_2OPO_3=$) and there is little saponification of the chloroethylphosphate. The fibres are then treated first with dil. mineral acid to replace all the alkali metal atoms by hydrogen and then with ammonia until one equivalent of ammonia per mole of phosphorus has been neutralised. This greatly reduces the combustibility of the fibres. C.O.C.

Combined Goffered and Glazed Chintz Finish
Joseph Bancroft & Sons Co. *USP* 2,743,190

Fabric previously given a permanent patterned goffered finish is impregnated with the pre-condensate of a resin, friction calendered and then baked. C.O.C.

Ban-Lon (VI p. 63)
Acid and Alkali Resistance of Partially Acetylated Cotton Fabrics (VI p. 64)
Dyed Crimped Yarns of Synthetic Fibres (VIII p. 67)
Applications of Radioactivity in the Textile Industry (XIV p. 76)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Water Solubilities and Heats of Solution of Short-chain Cellulosic Oligosaccharides
J. B. Taylor

Trans. Faraday Soc., **53**, 1198–1203 (Sept. 1957)

Water solubilities of cellobiose, cellotriose, cellotetraose, and cellopentaose have been measured at 25–65°C. Solubility decreases rapidly as chain length increases. Heats of solution of cellobiose and cellotriose and heats of dilution and partial molar volumes of cellobiose solutions are reported. W.R.M.

Action of Chlorous Acid on Hydrocelluloses
G. F. Davidson and T. P. Nevell

J. Textile Inst., **48**, T 356–T 361 (Sept. 1957)

With suitably chosen conditions, all the aldehyde groups in periodate oxycelluloses can be oxidised to carboxyl groups by acidified chlorite solutions. However, quantitative conversion of aldehyde groups in hydrocelluloses to carboxyl groups cannot be effected by chlorous acid—their reducing power is diminished and their carboxyl content increases, but some reducing power remains in all the experiments. Reducing power was measured by the "copper number", and carboxyl content by Methylene Blue absorption. P.T.S.

PATENTS

Glossy, Matt, or Patterned Surfaces on Paper, etc.
Buntpapierfabrik *BP* 784,637

Coated paper or other material with glossy, matt or patterned surface is produced more economically by bringing the coating in a wet state into contact with a glossy, matt or patterned repellent surface such as a cellulose ether or ester, a polymeric vinyl chloride or acrylate compound superposed on a carrier belt. G.S.B.

Carbon Paper
Goodyear Tire & Rubber Co. *BP* 785,083

Carbon paper of increased strength is obtained by lamination of oriented rubber hydrochloride film stretched to at least double its original area to the reverse side of a tissue carrying a carbon transfer composition coating. G.S.B.

Colouring Polymeric Esters or Ethers (VIII p. 67)
Hardening Varnish Coatings on Leather, Cloth or the like (X this page)
Photochemistry of Polymer Films (XIII p. 71)

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Thiols, Disulphides, and Thiosulphates—Some New Reactions and Possibilities in Peptide and Protein Chemistry
J. M. Swan

Nature, **180**, 643–645 (28 Sept. 1957)

Cystine disulphide bonds in wool are broken by reaction with ammonium cupric sulphite, and a thiosulphate is formed. The reagent dissolves 85–90% of the wool, and a protein—*S*-sulphokerateine—can be precipitated from the solution. If sulphite containing radioactive S is used, the protein acquires a radioactive label. The reaction also provides a very sensitive test for the presence of thiol or disulphide in a protein. Common and rarer amino acids and a range of dipeptides are unaffected by the cupric sulphite reagent. Thiosulphates derived from cysteine can be used to form mixed disulphides. Reaction of alkyl thiosulphates with cyanide to give thiocyanates leads to a potential method for specific fission of peptide and protein chains at cystine or cysteine residues. W.R.M.

Dyeing of Glove Leather
R. Vrbacký and V. Vrbacka

Kožařství, **6**, 180–183, 194–197 (1956):
J. Amer. Leather Chem. Assocn., **52**, 528–529 (Sept. 1957)

The effect of pH was studied. In dyeing glove leather, pH varies from 3 to 9. The work of Belavsky and Kratky (*Chem. Abs.*, **32**, 6497[e]) and Pektor and Radil (*Chem. Abs.*, **49**, 7280e) is referred to; the latter authors studied the effect of pH on dyes at pH 1–11. Changes in hue with pH were studied with a photocolorimeter, and results are tabulated. Mixtures of dyes, even those containing minor amounts of shading dyes, give most trouble due to changing pH, because of different penetration, especially with suède. Small-scale tests are difficult to translate into production. Chromatography of dyes is recommended (see Grassmann and Hübner, *J. Amer. Leather Chem. Assocn.*, **49**, 641 (1954)). Ascending chromatograms were made on Schleicher & Schüll 2043B paper, 200 × 300 mm., using 1% aqueous solutions of acid and direct dyes, spotted

30 mm. apart and 25 mm. from the lower edge. The lower 10 mm. of the paper is immersed in developing solution. R_f values vary greatly with pH value. For controlling pH, solutions of acetic acid, its salts, and ammonia were used. Two-way chromatography gives still better results. For circular paper chromatography Grassmann's method (*loc. cit.*) was changed by using a paper wick to draw the solutino on to the paper. Paper electrophoresis was used for studying ionised compounds. Overheating causes concentration of the components in the centre of the paper. An e.m.f. of 100 v./cm. is recommended. A Plexiglass cuvette, with carbon electrodes located under the paper, was developed. For studying the affinity of dyes for leather the method of Franz and Latinek (*Chem. Abs.*, **49**, 9352*e*), which gives the relation between R_f and dipole moment, and that of Schweitzer and Lollar (*J. Amer. Leather Chem. Assocn.*, **47**, 140 (1952)) are recommended. Chromatography of dyes on leather was attempted using a disc of washed, neutralised, wet, Cr-tanned goat leather. The dye solution was applied at the centre of the disc. Because the leather was already wet, R_f values, i.e. ratio of travel of dye to travel of solvent, could not be determined, so relative R_f values were measured, taking the R_f of Orange GG as 1. C.J.W.H.

Use of Ammonium Salts and Enzymes instead of Acid Pickle in the Dressing of Fur Skins
H. Herfeld and S. Beyer
Ges. Abh. dtsch. Lederinst., No. 13, 69 (1956): *J. Soc. Leather Trades Chem.*, **41**, 329 (Sept. 1957)

Determination of some Constants of Aqueous Pigment Colours for Leather
R. A. Metlitskaya
Trudy Tsentral. Nauch.-Issledovatel. Inst. Kozheven. Prom., **21**, 38–48 (1952): *Chem. Abs.*, **51**, 13443 (10 Sept. 1957)

The properties imparted to leather finishes by gelatin, casein, egg albumin, fresh blood, shellac, wax and linseed decoction are discussed and formulae given. C.O.C.

Hardening Varnish Coatings on Leather, Cloth or the like (X p. 70)

XIII—RUBBER; RESINS; PLASTICS

Photochemistry of Polymer Films
G. S. Egerton and A. G. Roach
Nature, **180**, 189–190 (27 July 1957)

Cellulose, cellulose acetate, and nylon films, in dry nitrogen or oxygen, have been exposed to ultraviolet radiations of wavelengths near 2537 Å. The optical density of the cellulose and cellulose acetate increases much more in nitrogen than in oxygen, but the reverse is the case with nylon. Small changes in the plastic properties of the nylon occur, but cellulose-type films show a rapid deterioration of film-like properties. On storage in the dark after irradiation the optical density of all the films increases, but it falls on re-irradiation. It is suggested that irradiation causes the formation of free radicals, which only slowly recombine. On storage in the dark some recombination occurs, but the compounds formed are very susceptible to photolysis. W.R.M.

***m*-Xylylenediamine Polyamide Resins**
E. F. Carlston and F. G. Lum
Ind. Eng. Chem., **49**, 1239–1240 (Aug. 1957)

m-Xylylenediamine (I) possesses the high reactivity which is typical of aliphatic rather than aromatic diamines. It forms crystalline polymers with dibasic acids containing an even number of C atoms, and amorphous polymers with dibasic acids of odd C number. Polymers of I and aliphatic dibasic acids are intermediate in m.p. between the corresponding polymers of penta- and hexa-methylenediamine. It is considered that I is a promising raw material for the production of polyamide fibres, films, and moulding compositions. W.K.R.

PATENTS

Rendering Synthetic Resins Flame-resistant
Diamond Alkali Co. *BP* 779,288

A mixture of a chlorinated organic material ($\nless$ 50% by wt. Cl content) and an organic compound of Sb, Ag and Bi in which the organic radical is linked to the metal by O incorporated in synthetic resins improves their flame-resistant properties while not affecting their moulding properties. C.O.C.

Water Vapour-permeable, Composite, Leather-like Sheets
DuP *BP* 782,031

Layers of fibres and a thermoplastic polymer are formed into a sheet by heat and pressure. The top layer of fibres should be soluble in a solvent. The composite sheet is then treated with this solvent to dissolve out the fibres there and so leave the surface of the sheet full of micropores. C.O.C.

Stable Dispersions of Vinylidene–Vinyl Copolymers (III p. 49)
Coated Titanium Dioxide Pigments for Styrene Polymers (IV p. 62)
Colouring Polymeric Esters or Ethers (VIII p. 67)

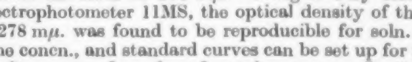
XIV—ANALYSIS; TESTING; APPARATUS

Distillation Apparatus for Moisture Determination
T. Barr and J. I. Yarwood
Chem. and Ind., 803–805 (22 June 1957)

A modification (I) of Tryon's apparatus (II) (cf. *Bur. Stand. J. Res.*, **45**, 362–365 (1950)) is described, and its accuracy compared with that of the standard 10-ml. capacity apparatus of Dean and Stark (*B.S.* 756 (1952)) (III). The latter was further improved by a siloxane coating. In II, water distilled from the sample and collected in the receiver is drawn into the measuring tube by an aspirator. In I, a siphon instead of an aspirator dispenses with the need for a separate suction device, makes it easier to position the water for measurement, and more than doubles the capacity of the apparatus. Constructional details with illustration are given. Data on the accuracy and useful range of I indicate its superiority over II, and it has the additional advantage of use for the estimation of materials containing small amounts of moisture or of bulky fibrous materials such as rabbit fur, and of substances as varied as shellac, wool, and felt. Details for coating the apparatus with a soln. of silicone polymer in CCl_4 are included. H.H.H.

Quantitative Estimation of a Non-ionic Detergent
J. C. Griffith
Chem. and Ind., 1041–1042 (27 July 1957)

Non-ionic soaps are, in general, polyethylene oxide products, and no satisfactory method for their determination has yet been reported, while methods involving titration with $KMnO_4$ and potentiometric titration are definitely unsuccessful. An ultraviolet spectrophotometric method is now outlined which appears to fulfil the special requirement of detecting small changes in concn. The detergent examined is Titon X-100 (Rohm & Haas) (I), whose ultraviolet spectrum shows a peak at 278 mμ. and a small inflexion at 283 mμ. Using a Cary Recording Spectrophotometer 11MS, the optical density of the peak at 278 mμ. was found to be reproducible for soln. of the same concn., and standard curves can be set up for optical density–concn. for soln. of varying concn. In this way concn. as low as 0·005% wt./vol. have been determined.



(I)

H.H.H.

Quantitative Estimation of Non-ionic Detergents
J. R. Tate
Chem. and Ind., 1324 (5 Oct. 1957)

On the problem of the quant. estimation of non-ionic detergents (see Griffith, previous abstract), the following three suitable methods are cited—(1) Brown and Hayes (*Analyst*, **80**, 755–767 (1955)), using ammonium cobaltithiocyanate, with which a blue ppt. is formed sol. in $CHCl_3$ and estimated colorimetrically at 620 mμ.; application can be made to several types of polyethylene-oxide adducts of chain length > 3, and gives accuracy better than 1%. (2) Evans (*1st World Congress on Surface-active Agents*, 202 (1954)), and (3) Stevenson (*Analyst*, **79**, 504 (1954)). Both (2) and (3) are absorptiometric methods involving coloured soln., which eliminate interference from materials eluted during adsorption studies on insol. proteins. H.H.H.

Benzidine—A.B.C.M. Subcommittee Report on its Determination
G. Spencer

Chem. and Ind., 1016 (20 July 1957)

Attention is drawn to an important omission from the above report (cf. *J. Appl. Chem.*, **6**, 525 (1956)), viz. the use of the Lovibond comparator for the determination of benzidine by the Chloramine T method. It so happens that the Lovibond colour discs, intended for the determination of chlorine in water, match the colour obtained in the above test, and the Subcommittee found that, using a 1-cm. cell or a 13·5-mm. tube, the disc 3/2 A.P.A. (0·02–0·3 p.p.m. Cl) covers the range 0–15 μg. of benzidine, and 3/2 A.P.B. (0·2–0·8 p.p.m. Cl) the range 10–35 μg. of benzidine. Each operator makes his own initial standardisation, which is quite straightforward. The test can, if necessary, be carried out by a chargehand or process man. H.H.H.

Chromatography of Dye Intermediates. VI—Paper Chromatography of *N*-Arylaminonaphthalenesulphonic Acids
J. Latinák and L. Skalický

Chem. Listy, **51**, 91–96 (1957): *Chem. Abs.*, **51**, 11935 (25 Aug. 1957)

Paper chromatography of *N*-arylaminonaphthalenesulphonic acids on Whatman No. 4 filter paper at 20 ± 1°C., using Ehrlich's and Gibbs' reagents for detection, yielded the following R_f values in the systems butanol–acetic acid–water (4:1:5), butanol–pyridine–water (3:1:1), propyl alcohol–aq. $NaHCO_3$ (2:1) and R_f for the last system when the paper was impregnated with aq. 5% $NaHCO_3$: 1-aminonaphthalene-8-sulphonic: 0·69, 0·63, 0·63, 0·86; *N*-phenyl-1-aminonaphthalene-8-sulphonic: 0·81, 0·78, 0·82, 0·95; *N*-(*p*-tolyl)-1-aminonaphthalene-8-sulphonic: 0·81, 0·81, 0·84, 0·95; 1-aminonaphthalene-5-sulphonic: 0·26, 0·44, 0·50, 0·68; *N*-phenyl-1-aminonaphthalene-5-sulphonic: 0·75, 0·71, 0·79, 0·95; 2-aminonaphthalene-6-sulphonic: 0·32, 0·46, 0·51, 0·75; *N*-phenyl-2-aminonaphthalene-6-sulphonic: 0·72, 0·69, 0·77, 0·94; 2-amino-8-naphthol-6-sulphonic; 0·22, 0·42, 0·47, 0·25; *N*-phenyl-2-amino-8-naphthol-6-sulphonic; 0·66, 0·70, 0·71, 0·84; 2:8-dihydroxynaphthalene-6-sulphonic; 0·35, 0·56, 0·57, 0·24; 8:8′-dihydroxy-2:2′-dinaphthylamine-6:6′-disulphonic; 0·05, 0·23, 0·27, 0·05; 2-amino-5-naphthol-7-sulphonic: 0·25, 0·43, 0·47, 0·20; *N*-phenyl-2-amino-5-naphthol-7-sulphonic: 0·66, 0·71, 0·71, 0·81; 2:5-dihydroxynaphthalene-7-sulphonic: 0·37, 0·57, 0·60, 0·20; 5:5′-dihydroxy-2:2′-dinaphthylamine-7:7′-disulphonic: 0·06, 0·21, 0·24, 0·04; 2:3-dihydroxynaphthalene-6-sulphonic: 0·26, 0·48, 0·52, 0·25; 2-aminonaphthalene-5:7-disulphonic acid: 0·03, 0·06, 0·14, 0·18; *N*-phenyl-3-aminonaphthalene: 0·95, 0·93, 0·90, 0·95; 2-acetamido-8-naphthol-6-sulphonic: 0·34, 0·52, 0·59, 0·38; 2-acetamido-5-naphthol-7-sulphonic: 0·36, 0·55, 0·58, 0·35; 2-aminonaphthalene-6:8-disulphonic: 0·03, 0·04, 0·17, 0·21; 2-naphthol-6:8-disulphonic: 0·05, 0·12, 0·27, 0·09. C.O.C.

Paper Chromatography of Acid Triphenylmethane Dyes
J. Dobáš

Chem. Listy, **51**, 1202–1203 (1957): *Chem. Abs.*, **51**, 11720 (10 Aug. 1957)

A descending method for qualitative checking of the purity and separation of dyes in the 2-phase system butanol–pyridine–water (3:1:3). The composition of the upper layer is 51% butanol, 19·5% pyridine, 29·5% water that of the lower layer 88·5% water, 4·5% pyridine, 7% butanol. R_f values are given of 10 dyes obtained by developing at 18–20°C. with the upper layer in chromatograms saturated with vapour of the lower layer of water. The first combination gives better separation of isomers and homologues. C.O.C.

Use of Aluminium Chloride in the Characterisation of Anthraquinone Derivatives
W. Bradley and P. N. Pandit

Chem. and Ind., 955–956 (6 July 1957)

Typical colours develop on the addition of aluminium chloride in nitrobenzene and a few drops of pyridine to solutions of aminoanthraquinones and some other anthraquinone derivatives in sulphuric acid. W.R.M.

Identification of Organic Compounds. XVII—Identification of Anthraquinonesulphonic Acids
M. Večeřa and J. Borecký

Chem. Listy, **51**, 974–976 (1957): *Chem. Abs.*, **51**, 11938 (25 Aug. 1957)

S-(Benzyl)thiuronium (I) and S-(1-naphthylmethyl)-thiuronium salts (II) of anthraquinonesulphonic acids (III) were used to identify III. An aqueous solution of $C_6H_5CH_2SC(:NH)NH_2$ or $1\text{-}C_{10}\text{-}H_7CH_2SC(:NH)NH_2$ was stirred into a saturated aqueous solution of the Na or K salt of III at 50°C. The precipitated crystals gave constant m.p. usually after 1–2 crystallisations. (Position of SO_3H groups in III, solvent, m.p. in the Kofler block, and m.p. in capillary tube given): I salt of III; 1, 30% alcohol, 197–8, 194·5–195·5; 2, 30% alcohol, 210–211, 207–8; 1:5, 30% alcohol, 280–290 (blackened), —; 1:6, methyl alcohol, 230–1, 227–8; 1:7, methyl alcohol–acetone, 222·3, 220·5; 1:8, 30% alcohol, 281–2 decomp., 278 decomp.; 2:6, 30% alcohol, 283–4 decomp., 275 decomp.; 2:7, 30% alcohol, 210–211, 207·5–208; II salts of III: 1, 50% alcohol, 232–4, 228–233 decomp.; 2, methyl alcohol, 110–120, 105–148; 1:5, 30% alcohol, 248–251 decomp., 252–4 decomp.; 1:6, 50% alcohol, 252–6 decomp., 254 decomp.; 1:7, 50% alcohol, 160–7, 150–183; 1:8, 80% alcohol, 246–250, 248–9; 2:6, 80% alcohol, 261·5–262·5, 262·5; 2:7, 30% alcohol, 267–270, blackened. C.O.C.

Separation of Permissible Food Dyes by Two-dimensional Chromatography and Electrophoresis on Paper
J. R. A. Anderson, L. C. Lock, and E. C. Martin

Australian J. Appl. Sci., **8**, 112–119 (1957): *Chem. Abs.*, **51**, 12369 (25 Aug. 1957)

The dyes are extracted from the food with butanol, the solution saturated with 2N-HCl and the dyes' R_f values determined on filter paper by partition chromatography (both 1- and 2-dimensional) in two suitable solvents and then, if necessary, their movements by electrophoresis in both acid and alkaline media measured. Data for 20 dyes are given. C.O.C.

Use of the Acid Phosphatase Test in Searching for Seminal Stains
S. S. Kind

J. Criminal Law, Criminol., Police Sci., **47**, 597–600 (1957): *Chem. Abs.*, **51**, 11941 (25 Aug. 1957)

The material under test is placed flat and completely covered with damp 40 × 60 cm. esparto blotting paper. All excess water must be removed from the blotting paper by blotting or by rolling to insure faithful reproduction of the stain. The damp paper is firmly pressed on the article for 5 min. It is then removed and sprayed with the following reagent (in g./litre): Ca 1-naphthyl phosphate 2, Brentamine Fast Blue B Salt (ICI) (C.I. Azoic Diazo Coupling Component 48) 4, glacial acetic acid 5, $NaOOCCH_3{\cdot}3H_2O$ 20, NaCl 210, detergent (Teepol) 1. After spraying the paper imprint with this reagent the colour resulting from acid phosphatase appears in a few min. C.O.C.

Control of Textile Quality in relation to Consumer Requirements
H. W. Best-Gordon and H. A. Thomas

J. Textile Inst., **48**, P 648–P 673 (Sept. 1957)

This paper contains a survey of quality-control schemes in various countries, in particular the Courtaulds' Tested-Quality Plan. In this plan wearing trials and serviceability testing are carried out over a cross-section of the market, and measurements of shrinkage, and loss of colour on washing and exposure are made in addition to observation of make-up and appearance (C. P. Tattersfield and H. A. Thomas, *ibid.*, **44**, P 541 (1953)). The second part of the paper deals with the technical aspects of quality control with detailed sections on fabric construction in relation to performance, colour-fastness, seams, durable pleats, decorative effects, fashion, abrasion assessment, and various finishes. P.T.S.

Determination of the Fluidity of Linen Materials in Cuprammonium Hydroxide Solution
Textile Institute

Tentative Textile Standard No. 45 (1957); *J. Textile Inst.*, **48**, P 675–P 679 (Sept. 1957)

A sample of material, after a preliminary treatment has removed non-cellulosic matter and soluble modified

cellulose, is dissolved in a standard cuprammonium solution in a tube which is attached, via a filter, to the viscometer. The cellulose solution is drawn through the filter into the viscometer with as little as possible contact with the atmosphere. The viscometer and its contents are brought to 20°C. in a thermostatically controlled water-bath. The solution flows through a capillary, and the time taken for the meniscus to move between two marks is measured. The apparatus is calibrated with a solution of known viscosity to determine two constants in a formula. A diagram of the apparatus and details of the method are given. P.T.S.

Use of Paper Chromatography in the Recognition of Chemical Damage to Wool
V. Köpke and B. Nilssen

J.S.D.C., **73**, 413–416 (Sept. 1957)

Hydrolysis of wool has been carried out by means of acid, alkali, and papain, the resulting solutions being analysed by one- and two-dimensional chromatography. Acid hydrolysis appears to be the most convenient method. Experiments on desalting the amino-acid solutions by the method of Consden, Gordon, and Martin show that this cannot usually be employed for purifying the solutions, as cysteic acid, methionine, and probably tyrosinesulphonic acid are destroyed during the process. The method has been used for wool treated with alkali, hydrogen peroxide, and sulphuric acid. In the present form the method is sensitive only to severe damage. AUTHORS

Reclamation of Fibres from Rags
J. C. Atkinson and J. B. Speakman

I—Identification of Non-carbonisable Fibres

J.S.D.C., **73**, 417–419 (Sept. 1957)

Staining tests to distinguish between carbonisable, non-carbonisable, and protein fibres, and between the chief non-carbonisable fibres, have been developed. The fibres are treated with a mixture of fluorescent compounds, in presence of a stripping agent if dyed, and are then examined in ultraviolet radiation. In a few cases, notably when the non-carbonisable fibres are heavily dyed black, stripping should precede staining.

II—Isolation of Wool from Mixtures of Wool and Terylene

Ibid., 419–423

Wool may be recovered from mixtures of Terylene and wool by treatment with a 2% solution of hydrazine in butanol at 100°C. for 60 min. Whereas Terylene is completely destroyed under these conditions, the wool suffers only slight damage. AUTHORS

Random-tumble Pilling Tester
E. M. Baird, L. C. Legere, and H. E. Stanley

Text. Research J., **26**, 731–735 (Sept. 1956); *Amer. Dyestuff Rep.*, **46**, P 365–P 368 (20 May 1957)

Details and photograph of an apparatus to test the pilling tendencies of fabrics by tumbling them in a rubber-lined cylinder. The test is said to compare well with results in use. P.T.S.

Quantitative Determination of End-groups in Polycaprolactam
V. A. Myagkov and A. B. Pakshver

J. Appl. Chem. U.S.S.R., **29**, 1703–1707 (Nov. 1956)

A 4-g. sample of the polyamide is dissolved in 9–12 ml. of acid-free phenol, precipitated by addition of 35–40 ml. of CH_3OH or C_2H_5OH, diluted to 200–250 ml. with H_2O, filtered off, and washed. The solid so obtained is transferred to a 200-ml. standard flask, 20 ml. of 0·025 N-HCl containing 0·5 M-KCl or NaCl added, made up to the mark, and topped with 3·5 ml. of H_2O. After 10–20 min. the contents of the flask are filtered, and 100-ml. portions titrated with NaOH using methyl red as indicator. The number of $-NH_2$ groups B in moles/g. is given by—

$$B = \frac{(V_x - V_p)\, V_k \cdot N}{V_t\, 1000\, a}$$

where V_k = vol. of flask in ml., V_t = vol. of HCl in ml., a = wt. of polyamide in g., N = normality of NaOH, V_x = vol. of NaOH in ml. used for the blank titration of V_t ml. of HCl soln., and V_p = vol. of NaOH in ml. used for titration of V_t ml. of acid used in the reaction with the polyamide. The number of –COOH groups can be determined by back-titration of NaOH used with HCl, and substituting values in the above equation. The amine groups can also be determined by adding 50 ml. of standard Methyl Orange soln. to the reprecipitated polyamide, contained in a 200-ml. standard flask, filtering the contents made up to the mark with water, and determining the conc. of the indicator in the filtrate colorimetrically. The number of $-NH_2$ groups B is given by—

$$B = \frac{(C_x - C_p)\, 100}{1000a}$$

where C_x = concn. of the indicator before treatment, C_p = conc. of the indicator in the filtrate. T.Z.W.

Sample-dyeing Device
B. Mihalik

Magyar Textiltechnika, (8), 212–216 (1955): *Hungarian Tech. Abs.*, **8**, 56–57 (1956)

The Gresits-Mihalik sample-dyeing device consists of a stainless-steel cylinder adjustable for taking various amounts of fibres, a sample container subdividable by perforated plates, and a pump for circulating the dye liquor. The latter is of the propeller type, and its speed and sense of rotation can be varied according to requirements. Fibres of different types can be dyed separately and yet simultaneously; their behaviour can be studied at the same time. Temperature can be regulated by means of a built-in thermometer coupled to a thermo-regulator acting on the gas or electric heating. The liquid can be drained and exchanged, the processed batch cooled, rinsed, etc. C.J.W.H.

Errors in the Assessment of Colour Fastness
U. Bülow and S. Horrdin

J.S.D.C., **73**, 459–464 (Oct. 1957)

The different sources of variation in assessing fastness, especially light fastness, are discussed. By a variance and component analysis the total variance and its components—the process variation, the testing variation, and the assessment variation—have been estimated for eight different dyeings on a cotton fabric. The assessment variation is found to be considerable, depending both on differences with one and the same observer (time factor) and on differences between different observers (observer factor). The possibility of obtaining a truer estimate of fastness is briefly discussed. AUTHORS

Thermotest Apparatus for Testing Fastness to Sublimation
Anon.

Teintex, **22**, 343–347 (May 1957)

A composite sample of dyeing and adjacent white is stretched at fixed tension over a stainless-steel bed. A cover carries 12 stainless-steel blocks heated electrically to give a linear increase of temperature from No. 1 to No. 12 and is pressed under fixed pressure against the composite for a given time. The behaviour of a dye at a wide range of temperatures can thus be studied rapidly. In particular, the temperatures at which sublimation begins and at which it reaches serious proportions can be determined in one operation. S.R.C.

Calculation of C.I.E. Coordinates of Colour Tolerance Ellipsoids
A. Opler and M. D. Yeaman

J. Opt. Soc. Amer., **47**, 253–255 (March 1957)

Electronic digital computers are used to calculate ellipsoids corresponding to given colour tolerances ΔE from the Adams-Nickerson colour-difference formula. Results are compared with classical experimental data of Brown and MacAdam. Application to routine work on colour tolerance is pointed out. R.B.B.

Simple Absolute Method for measuring Diffuse Reflectance Spectra
K. Shibata

J. Opt. Soc. Amer., **47**, 172–175 (Feb. 1957)

An alternative to the integrating sphere method is described, based on the use of a small sheet of opal glass, which diffuses the light beam before it falls on the sample. The theory of the method is worked out and checked using magnesium oxide. It is claimed that, in providing an independent means for measuring absolute reflectances, the method can be readily used for many purposes, because it employs a simple attachment for commercially available recording spectrophotometers. R.B.B.

Colour Discrimination of Twelve Observers
W. R. J. Brown

J. Opt. Soc. Amer., **47**, 137–143 (Feb. 1957)

Results are presented of a study by twelve observers of visual sensitivity using a MacAdam binocular wide-field colorimeter. The rest of the field being filled with a uniform surround colour, conditions are very similar to those under which colours are usually matched and compared. Discrimination ellipsoids about 22 colour centres were obtained. The results were generally similar to those obtained in an earlier study with a 2° field and dark surround, using only two observers. Some differences were noted, particularly in the ratio of the largest to the smallest ellipsoids. Presumably binocular matching conditions in a wide field tend to reduce colour discrimination differences to some extent and the mean of a group of observers is unlikely to vary as much from chromaticity to chromaticity as would a single observer. R.B.B.

Analytical Approximations for Colour Metric Coefficients
D. L. MacAdam

J. Opt. Soc. Amer., **47**, 268–274 (April 1957)

Newly available colour-discrimination data for 12 normal observers (see previous abstract), are examined in relation to formulae put forward by von Schelling for colour metric coefficients based on the assumption of constant negative or zero curvature for colour space. It is concluded that this assumption is an oversimplification. R.B.B.

New Federal Standard on Colours

J. Opt. Soc. Amer., **47**, 330–334 (April 1957)

Federal Standard Number 595, March 1, 1956, consists of 10 pages of 358 colour chips ($\frac{1}{2} \times \frac{3}{4}$ inches) also obtainable on 3×5 inch cardboards together with text, which contains non-standard spectrophotometric data. Gloss, semi-gloss and lustreless (or flat) colour chips are included and the standards are primarily for paint. Obtainable from General Services Administration, Business Service Centre, Region 3, Seventh and D Streets, S.W., Washington 25 D.C. R.B.B.

Prediction of Colour Appearance with Different Adaptation Illuminations
R. W. Burnham, R. M. Evans, and S. M. Newhall

J. Opt. Soc. Amer., **47**, 35–42 (Jan. 1957)

Results are presented of a carefully designed study of chromaticity shifts with adaptation to illuminants A and C and to a greenish (specified) illuminant "G" ($x = 0{\cdot}3446$, $y = 0{\cdot}4672$). Charts presented show that the magnitude of the shift in colour specification for colours which look alike with different adaptations, is substantial and in the expected direction. Predictions of colour appearance may be made by means of a procedure based on the assumption of linear change in colour response with change in adaptation. R.B.B.

Comparison of Successive with Simultaneous Colour Matching
S. M. Newhall, R. W. Burnham, and J. R. Clark

J. Opt. Soc. Amer., **47**, 43–56 (Jan. 1957)

An attempt is made to secure comparable results of colour matching by the successive or memory method and the more familiar operation of modifying one of two simultaneously presented colours to make it visually match the other colour. 25 test colours matched by both methods showed that memory matches required systematic increases in both purity (or chroma) and luminance (or value) as compared with the normal colorimetric matching procedure. No systematic changes in dominant wavelength (or hue) were noted. Explanation in terms of an adaptation effect appears less satisfactory than the assumption that the more dominant, characteristic and attractive aspects of a colour stimulus tend to be retained in colour memory leaving the dominant colour in an exaggerated or purer form. R.B.B.

Estimation of the Alcoholate Content in Water-free Sodium Cellulose
E. Geiger and H. Nohs

Helv. Chim. Acta, **40**, 550–554 (May 1957)

The presence of the equilibrium between an addition compound between sodium hydroxide and cellulose and the true alcoholate has been established by adding glacial acetic acid and titrating the amount of water liberated in the reaction—

$$C_6H_{10}O_5NaOH + CH_3COOH \rightarrow C_6H_{10}O_5 + CH_3{\cdot}COONa + H_2O$$

using the Karl-Fischer method. True alcoholate reacted with the acetic acid to give cellulose and sodium acetate but no water. J.E.B.

Determination of the Recovery of Fabrics from Creasing
Textile Institute

Tentative Textile Standard No. 44;
J. Textile Inst., **48**, P 326–P 329 (May 1957)

A rectangular specimen is folded in half and maintained in that state for a specified time under a specified load. After the load has been removed and time has been allowed for some recovery, the angle between the arms of the specimen is measured. The apparatus and the procedure are described. P.T.S.

Estimation of Resin Distribution in Textiles
K. May and O. Rothe

Textil-Rund., **12**, 507–572 (Sept. 1957)

The unequal distribution of urea- and melamine-formaldehyde resins in finished goods was studied by staining with Tollens reagent, Crystal Ponceau, Kiton Pure Blue V, Acylnaphthoic Red, Bromophenol Blue, Rhodamine B, Naphtol AS-RL ← Fast Red Salt 3GL, and Chlorantine Fast Red 5B. The observations are tabulated. It is possible to obtain clear distinctions between fibres of differing resin contents with a number of stains, as is illustrated by photomicrographs. S.R.C.

Chlorine Retention of Resin Finishes on Cotton
W. Schefer

Textil-Rund., **12**, 512–521 (Sept. 1957)

In testing the potential danger of hypochlorite on a resin finish, a defined procedure related to practical conditions is difficult because of variation in washing and in the type and amount of resin, and the possible variations of temp., concentration, and pH of the hypochlorite in practice. The presence of resin-free textile also complicates the problem. The following points are stressed — (*a*) direct titration of the active and total Cl before and after treatment of the load is preferable to direct titration of the chlorine retained by the goods; (*b*) the active chlorine content must be high enough to allow for strongly absorbing changes; (*c*) good reproducibility is given only at low temp. (20 ± 2°C.); (*d*) the chlorine bath must be alkaline and held to 0·3 pH unit. S.R.C.

Determination of the Flammability of Apparel, Household, and Furnishing Fabrics
Textile Institute

Tentative Textile Standard No. 40a;
J. Textile Inst., **48**, P 418–P 425 (July 1957)

This tentative standard supersedes Tentative Textile Standard No. 40 (*ibid.*, **47**, P 799 and P 806 (1956)). The method of supporting the fabric to be tested at an angle of 45° given in Tentative Textile Standard No. 40 has been found to be unsuitable for fabrics of high flame resistance. The method in which the fabric was supported on a semicircular frame is unsuitable for fabrics of low flame resistance. Neither method is suitable for fabrics which melt and drip while burning. The semicircular test method has been replaced by one in which flame propagation along a vertical specimen is measured. The 45° test has been retained for fabrics with low flame resistance. Precise details of the apparatus, the test specimens, the procedure, the conditioning of specimens, and the pretreatment (washing, dry-cleaning) are given. P.T.S.

Water-repellency of Fabrics—some Differences between the Bundesmann and Drop-penetration Tests on Union Gaberdines
S. L. Anderson, W. Guy, and G. E. Settle

J. Textile Inst., **48**, P 330–P 336 (May 1957)

Both tests placed three gaberdines in the same order. At low values of penetration the tests are of comparable sensitivity. The wipers in the Bundesmann increase its sensitivity over that of the drop-penetration test at higher penetrations. The sensitivity of the drop-penetration test can be increased by increasing the porous area under the fabric. Until more is known of the correlation between laboratory tests and the behaviour of rainwear in practice, results of laboratory tests can be used only to indicate the order of superiority of fabrics: actual amounts of penetration and their ratios may be misleading. P.T.S.

Need for Standardising Accelerated Ageing Tests for Latex-backed Fabrics
R. H. Boggs and M. Taitel
Amer. Dyestuff Rep., **46**, 345 and 350 (20 May 1957)
This paper gives a table of the variables in the manufacture of latex-backed fabrics together with some details of the usual light and heat ageing tests. P.T.S.

Cellulose Swelling measured by Benzene Retention
G. A. Richter, L. E. Herdle, and W. E. Wahtera
Ind. Eng. Chem., **49**, 907–912 (May 1957)
The degree of swelling of cellulose by polar liquids can be measured by determining the sorption of benzene vapour after displacement of the swelling agent by liquid benzene. Benzene retention values vary widely, depending on the previous history of the cellulose, the nature of the swelling agent, and the conditions of treatment. It is considered that such measurements accurately reflect the extent of swelling of the cellulose at the time of displacement of the swelling agent with benzene. W.K.R.

Choice of Cellulose Concentration and Velocity Gradient for Determination of Intrinsic Viscosity in Cupriethylenediamine Solution
K. Wilson
Svensk Papperstidning, **60**, 509–512 (31 July 1957)
A simple and convenient viscometer for the determination of the intrinsic viscosity η of all types of pulp is described, its dimensions being such that the maximum velocity gradient G_{max} is 200 sec.$^{-1}$. Formulae and curves are given for calculation of these dimensions to give the required value for G in the range of viscosity to be determined. The cellulose concentration C was selected such that the product $\eta \times C$ lay between 2·5 and 3·5, which led to an accuracy sufficient for control purposes. G.S.B.

Fixation of Crotonaldehyde and Acrolein by Collagen—A Colorimetric Method for the Quantitative Estimation of the Aldehydes fixed in Collagen
S. M. Bose, K. T. Joseph, and B. M. Das
Bull. Cent. Leather Res. Inst. Madras, **2**, 163 (1956):
J. Soc. Leather Trades Chem., **41**, 328 (Sept. 1957)
A simple colorimetric method has been developed for the quantitative determination of crotonaldehyde and acrolein combined with collagen, using *m*-phenylenediamine hydrochloride as colour reagent. Accurate results are given in the presence of mineral acid and hydrolytic products of collagen. The combination of crotonaldehyde and acrolein with collagen has been studied under various conditions—at pH 3–11, in aldehyde concn. of 0·75–9·0%, at temp. of 5–55°c., and for tanning periods of 4 hr. to 4 days. Results are discussed. The amount of acrolein fixed by collagen has been found to be greater than the amount of crotonaldehyde fixed under similar conditions; this difference is explained in the light of electronic theory. C.J.W.H.

Determination of Small Amounts of Acrylonitrile in Effluents
G. W. Daues and W. F. Hamner
Anal. Chem., **29**, 1035–1037 (July 1957)
Acrylonitrile is concentrated by azeotropic distillation with methyl alcohol, and determined polarographically (half-wave reduction potential is −1·95 v. *versus* a saturated calomel electrode) with tetramethylammonium iodide as supporting electrolyte. As little as 0·1 p.p.m. acrylonitrile may be determined by this method. L.T.W.

Assay of Sodium Hydrosulphite
AATCC Committee on Analytical Methods
Amer. Dyestuff Rep., **46**, P 443–P 447 (17 June 1957)
Before analysis the sodium hydrosulphite is carefully sampled from its container, so that the surface layer of the hydrosulphite is avoided. The substance is not poured from its container—this would give an artificial number of larger particles. There are three analytical methods—(i) Reaction of the hydrosulphite with formaldehyde followed by titration against copper sulphate. (ii) Reaction with formaldehyde followed by titration against iodine. (iii) A standard dye solution (Pontacyl Rubine R, C.I. Acid Red 14) is reduced with the sample, and then excess dye is titrated against standard titanous sulphate. The iodimetric method is the simplest, but it is sensitive to oxidisable impurities such as thiosulphate and sulphide. Usually these are not present. The copper sulphate and dye methods are not sensitive to these impurities—of the two the copper method is the simpler. P.T.S.

Quantitative Determination of Antioxidants after a Chromatographic Separation on Completely Acetylated Filter Paper
J. W. H. Zijp

I—Determination of Phenyl-1-naphthylamine and Phenyl-2-naphthylamine

II—Determination of some *p*-Phenylenediamine Derivatives

Rec. Trav. chim., **76**, 313–316 and 317–320 (April 1957)
The quantitative estimation of antioxidants in rubber is carried out by solvent extraction of the antioxidant followed by separation of the oxidants by chromatography on completely acetylated Whatman No. 1 paper. The chromatogram spots are then estimated by colorimetric methods. The determination of the title compounds is given in detail. J.E.B.

Photoreduction of Bound Dyes
J. S. Berlin
Univ. Microfilms (Ann Arbor, Mich.).
Publ. No. 21414, 121 pp.
(microfilm \$2.00; paper enlargement \$12.00):
Dissertation Abstr., **17**, 12227 (1957):
Chem. Abs., **51**, 13581 (25 Sept. 1957)

Detection of Metanil Yellow (C.I. Acid Yellow 36) in Pulses Dal
S. N. Mitra and S. C. Roy
Current Sci. (India), **26**, 89 (1957):
Chem. Abs., **51**, 14151 (25 Sept. 1957)
Several routine methods of determining C.I. Acid Yellow 36 in various foodstuffs are described. A preliminary test can be made by adding a little conc. HCl to whole pulse in a test tube, a distinct violet resulting. A similar test is to dye wool in an aq. acidic extract of powdered pulse, stripping the dye with weak hot ammonia and treating the extract with conc. HCl or H_2SO_4. An aliquot of the ammoniacal solution can be chromatographed on paper in a mixture of *iso*-butanol–ethanol–water (4:1:4) for 18 hr. to separate the dye. C.O.C.

Evaluation of Whitening Efficiency of Fluorescent Whitening Agents
E. Allen
Amer. Dyestuff Rep., **46**, 425–432 (17 June 1957)
Fluorescent whitening agents absorb ultraviolet radiant energy and re-emit it as blue light, and thus the brightness and the whiteness of the cloth are increased. Fluorescent whitening agents can be compared by visual examination, but not precisely—it is difficult to compare whiteners of different shades. Accuracy is increased in some cases by viewing under ultraviolet illumination. A fluorimeter with a photocell is useful when comparing finishes using the same whitener, but a correction factor depending on the emission curve must be used to compare different whiteners. Specialised equipment is needed to obtain the data from which the correction factor can be calculated. A direct-reading fluorimeter which would not need a correction factor to compare different whiteners is suggested. P.T.S.

Detection of Acid Phosphatase, Menstrual Blood Stains, etc.
J. Forensic Med., **4**, (2), 82–89 (1957)

Investigation of Pigment Defects in Coatings by Modern Physical Methods
K. Heinle
Deut. Farben-Z., **11**, 217–226 (1957):
Chem. Abs. **51**, 14286 (25 Sept. 1957)
Three Fe_2O_3 pigments (I, II and III) were studied by optical and electron microscopic, sedimentation, X-ray and magnetic methods. Magnetic measurements are most important for determining differences in Fe_2O_3 pigments. I causes no defects in coating systems. It is diamagnetic α-Fe_2O_3, readily disperses in vehicles, resists sedimentation and the pigment particles in dispersions are uninfluenced by an external magnetic field. II gives levelling defects in coating systems. It is paramagnetic γ-Fe_2O_3, agglomerates in dispersions, sediments rapidly and in dispersion agglomerates and its particles line up in the direction of an external magnetic field. III flocculates in

coatings. It is a mixture of α-Fe_2O_3 and γ-Fe_2O_3, partly agglomerates in dispersions, sediments at a rate in between that of I and II, and in dispersions its particles are partly influenced by a magnetic field. Separation of the two components of III causes the flocculation. Other properties, e.g. oil demand, cutical pigment volume concentration, etc. of the three pigments are given. Differences in the degree of dispersion of Fe_2O_3 pigments by ball milling with steel balls and with porcelain balls are explained by the magnetic properties of the pigments. A classification of various pigment defects into those caused by pigment-binder chemical reaction, pigment binder physical interaction and pigment properties is given. C.O.C.

Applications of Radioactivity in the Textile Industry
I. A. Berstein

Amer. Dyestuff Rep., **46**, P 399–P 404 (3 June 1957)

Topics discussed include— (i) laboratory investigations using tracer techniques, (ii) analytical applications, (iii) effects of atomic radiation on fibres and polymers, and (iv) plant process control. For example, ^{14}C can be incorporated in resin finishes, and retention of finish then measured by retention of radioactivity in washing, dry cleaning, etc. Detergents are tested by soiling with radioactive material, measuring radioactivity before and after washing with detergent. The mechanism of organic reactions, such as polymerisations, can be investigated by radioactive tracer techniques. Absorption mechanisms, closely related to dyeing problems, can be studied with radioactive chemicals. Fibres radioactively marked can be followed during drafting. Amino-acid analysis of wool, silk, etc. is facilitated by labelling with radioactive iodine or copper compounds. The properties of fibrous polymers can be modified by atomic radiation— cross-linking and degradation can occur. If radioactive materials are incorporated in textile finishes, the amount of finish on the fabric can be estimated and controlled with a β-ray gauge. Radiation can be used to ionise air and thus disperse static charges on cloth. Radioactive tracers are used in process control. P.T.S.

Improved Fibre Rotator
E. C. Banky and S. B. Slen

Text. Research J., **27**, 417–418 (May 1957)

An improved rotator, employing magnetic chucks, is described for centering fibres in the field of view of a high-power microscope. It ensures that the image remains in focus whilst the fibre is rotated or is being traversed laterally. S.B.D.

Selective Solvents for Analysing Textile Fibre Mixtures
S. S. Praeger

Amer. Dyestuff Rep., **46**, 497–498 (15 July 1957)

A weighed textile sample is treated with acids, alkalis, salts, and organic solvents under standard conditions. A table gives the weight loss in each case. Chloroform will distinguish between secondary cellulose acetate and the triacetate— the latter is instantly soluble, the former insoluble. *NN*-dimethylformamide dissolves 6-nylon, but not 6,6-nylon. Acrilan dissolves in 57% $ZnCl_2$, in which Orlon was thought to be insoluble. Latest samples of Orlon are soluble in this reagent, and so far an alternative test has not been devised. 5·25% Sodium hypochlorite dissolves wool from fibre blends, so that it can be used to estimate their composition. In all, the solubilities of 19 fibres in 16 solvents or solutions are given. P.T.S.

Nomograph for Calculating Colour Differences using the Adams–Nickerson Equation
D. P. Adams, R. E. Derby, R. E. Ernsberger, and R. B. Solo

Amer. Dyestuff Rep., **46**, 649–654 (9 Sept. 1957)

The reflectance or transmission characteristics of an object can be measured with a spectrophotometer. The results, when combined with data about the source of light and the spectral sensitivity of the average observer, lead to three numbers— X, Y, and Z— the tristimulus values. Two colours with the same tristimulus values match under the conditions specified. Tristimulus values can easily be calculated, but it is impossible, from their tristimulus values, to state quantitatively the visual difference between two colours. Equal distances in the three-dimensional X, Y, Z diagram do not represent equal differences in colour. The Adams–Nickerson equation defines a colour difference in terms of the three co-ordinates, and this paper contains a model of the nomogram used to calculate colour difference from the three co-ordinates, which simplifies the calculation considerably. P.T.S.

PATENTS

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Apparatus is described for collecting, preparing, and subsequently dyeing samples of yarn so that the amount of dye absorption may be determined quantitatively in progressive sections of a sample. It is useful in the control of manufacturing operations to evaluate quickly the dyeing characteristics of yarn without converting it into fabric. W.G.C.

Fading Lamp
Quarzlampen *BP* 781,598

Apparatus for Testing the Abrasion Resistance of a Fabric
J. J. Press *BP* 779,750

Spectrophotometric Study of the Copper–Alizarin Sulphonate Complex (IV p. 54)
Graphical Aids to Quantitative Reflectance Spectrophotometry of Dyeings (VIII p. 65)
Acid Control in Feltmaking (X p. 68)
Tear Strength of Fabrics (X p. 69)

XV—MISCELLANEOUS

Influence of Gases on the Photoeffect of Organic Dyes
H. Meier

Z. Elektrochem., **59**, 1029–1037 (1955):
Chem. Abs., **51**, 10227 (25 July 1957)

The influence of O_2, N_2, H_2, CO_2 and air on the photoeffect of organic dyes results primarily in the build-up of the "active barrier layer" by O_2 and H_2. These gases also influence the primary photoelectric effect. With some dyes this latter effect increases with decrease in pressure, while with some other dyes increase in pressure increases the photoelectricity. C.O.C.

Reaction of Photographic Dye Components in Gelatin Solutions
F. Evva and I. Berty

Kolloid-Z., **1949**, 10–16 (1956):
Chem. Abs., **51**, 8557 (25 June 1957)

With increase in dye present the viscosity of gelatin solution first increases to a maximum, then decreases to a minimum and again increases. Dye molecules are adsorbed in the gelatin chain to give a hydrophilic polymer having long hydrophobic hydrocarbon chains. The latter interact with one another to form associated units, thus tending to increase the viscosity; this tendency is, however, opposed by the simultaneous contraction of individual gelatin molecules. Measurements of structural viscosity and the dependence of viscosity on temperature support this theory. C.O.C.

M. A. Il'inskii
B. M. Bogoslovskii

Tekstil. prom., **17**, 40–42 (May 1957)

Biography of the Russian pioneer colour chemist and technologist (1856–1941) in commemoration of the centenary of his birth. G.J.K.

Effect of Reducing Agents on the Colour of Cured Meat
G. G. Kelley and B. M. Watts

Food Technol., **11**, 114–116 (1957):
Chem. Abs., **51**, 12373 (25 Aug. 1957)

Cysteine, glutathione and ascorbic acid in equimolar concentrations are equally effective in catalysing production of nitric oxide hemoglobin from methemoglobin. In this way these reducing agents protect the surfaces of cured meats from fading by light. They regenerate the red pigment nitric oxide myoglobin in light-faded meat surfaces in presence of NO_2^+. C.O.C.

Trichromatic Ideas in the Seventeenth and Eighteenth Centuries
R. A. Weale

Nature, **179**, 648–651 (30 March 1957)

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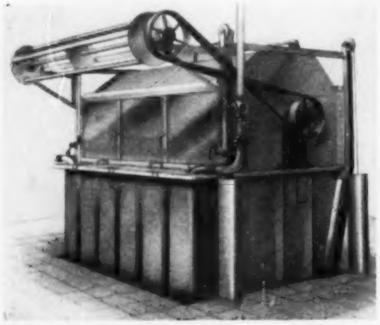
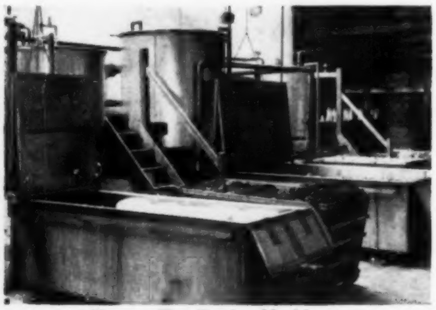


Above — Enclosed Piece Dyeing Machines

Above — Loose Wool Dyeing Plant



Above — Top Dyeing Machines

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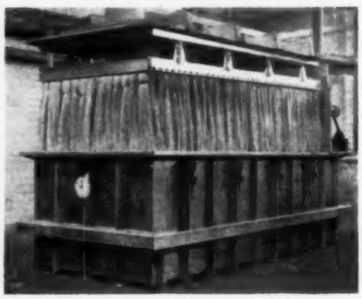

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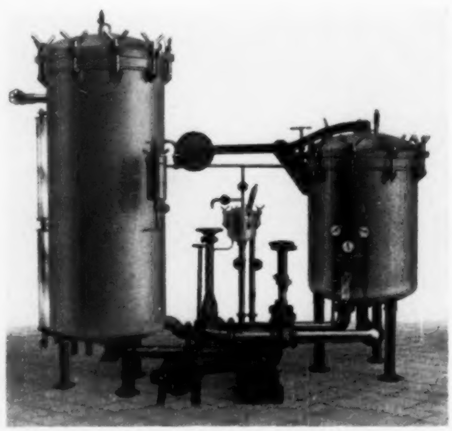

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FORTHCOMING MEETINGS OF THE SOCIETY—*continued from page vi*

Tuesday, 18th March 1958

SCOTTISH SECTION. *Easy Care Finishes on Fabrics Containing Courpleta, with special reference to Pleating, Embossing and Setting.* A. S. Cluley, Esq., F.T.I. and S. N. Bradshaw, Esq. (Courtaulds Ltd., Coventry). St. Enoch Hotel, **Glasgow.** 7.30 p.m. To be preceded by Sectional Annual General Meeting at 7 p.m.

Wednesday, 19th March 1958

MIDLANDS SECTION. *Optical Brightening Agents.* D. A. W. Adams, Esq., B.Sc., Ph.D. (Joint meeting with The British Association of Chemists.) Midland Hotel, **Derby.** 7 p.m.

Friday, 21st March 1958

MANCHESTER SECTION. One-day Symposium. *New Information on Finishing Processes.* Manchester College of Science and Technology, **Manchester.**

MIDLANDS SECTION. Section Annual Dinner. George Hotel, **Nottingham.**

Tuesday, 25th March 1958

HUDDERSFIELD SECTION. Annual General Meeting.

Thursday, 27th March 1958

BRADFORD JUNIOR BRANCH. *Continuous Dyeing of Wool.* D. R. Lemin, Esq., B.Sc. (I.C.I. Ltd.). Bradford Institute of Technology, **Bradford.** 7.15 p.m.

WEST RIDING SECTION. Annual General Meeting. Victoria Hotel, **Bradford.** 7.30 p.m.

Saturday, 29th March 1958

BRADFORD JUNIOR BRANCH. Annual General Meeting. Bradford Institute of Technology, **Bradford.** 10.15 a.m.

Thursday, 3rd April 1958

MIDLANDS SECTION. *Recent Trends in Dyeing for the Carpet and Hosiery Trades.* W. Beal, Esq., B.Sc. (Geigy Co. Ltd.). Messrs. Carpet Trades Ltd. Canteen, Mill Street, **Kidderminster.** 7.30 p.m. (Joint with the Textile Institute, Kidderminster Section.)

Wednesday, 16th April 1958

MIDLANDS SECTION. *Basic Principles of Dyeing with Disperse Dyes.* D. Finlayson, Esq., M.C., M.A., D.Sc. and H. C. Olpin, Esq., M.Sc., F.R.I.C., F.S.D.C. King's Head Hotel, **Loughborough.** 7 p.m. (Preceded at 6.30 p.m. by the Annual General Meeting of the Section.)

Friday, 18th April 1958

LONDON SECTION. *Colour Fastness Requirements of Luton Textiles.* I. Glasman, Esq., A.T.I. (Marks & Spencer Ltd.). George Hotel, **Luton.** 7 p.m.

MANCHESTER SECTION. Annual General Meeting. Details to be announced later.

Friday, 25th April 1958

The Society's Annual General Meeting and Dinner. The Central Hotel, **Glasgow C.1.**

Friday, 2nd May 1958

LONDON SECTION. Annual General Meeting and Dinner. Aldwych Brasserie, Aldwych, **London, W.C.2.** 6 p.m. for 6.30 p.m. (Mr. C. O. Clark will speak on the standards required for the A.S.D.C. examination.)

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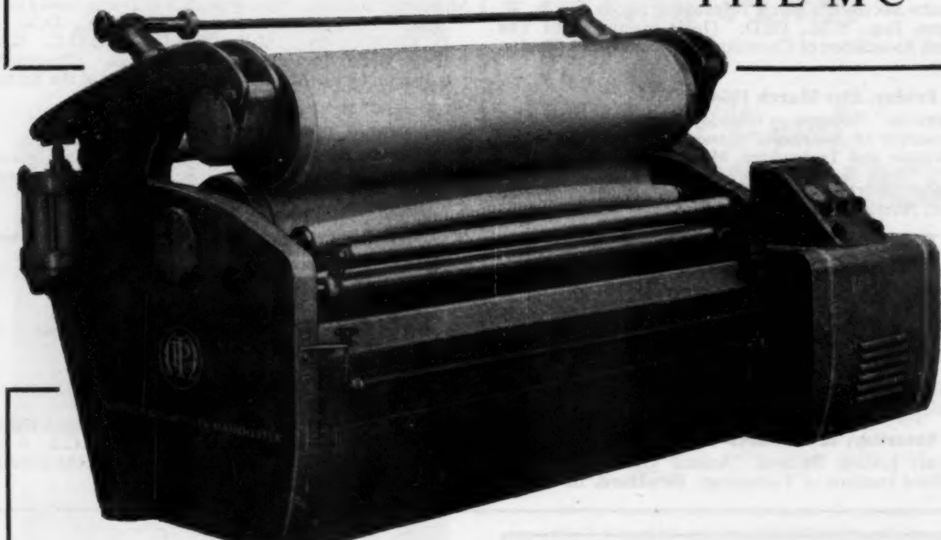

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All inquiries relating to Advertisements should be addressed to THE GENERAL SECRETARY, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKSHIRE.

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